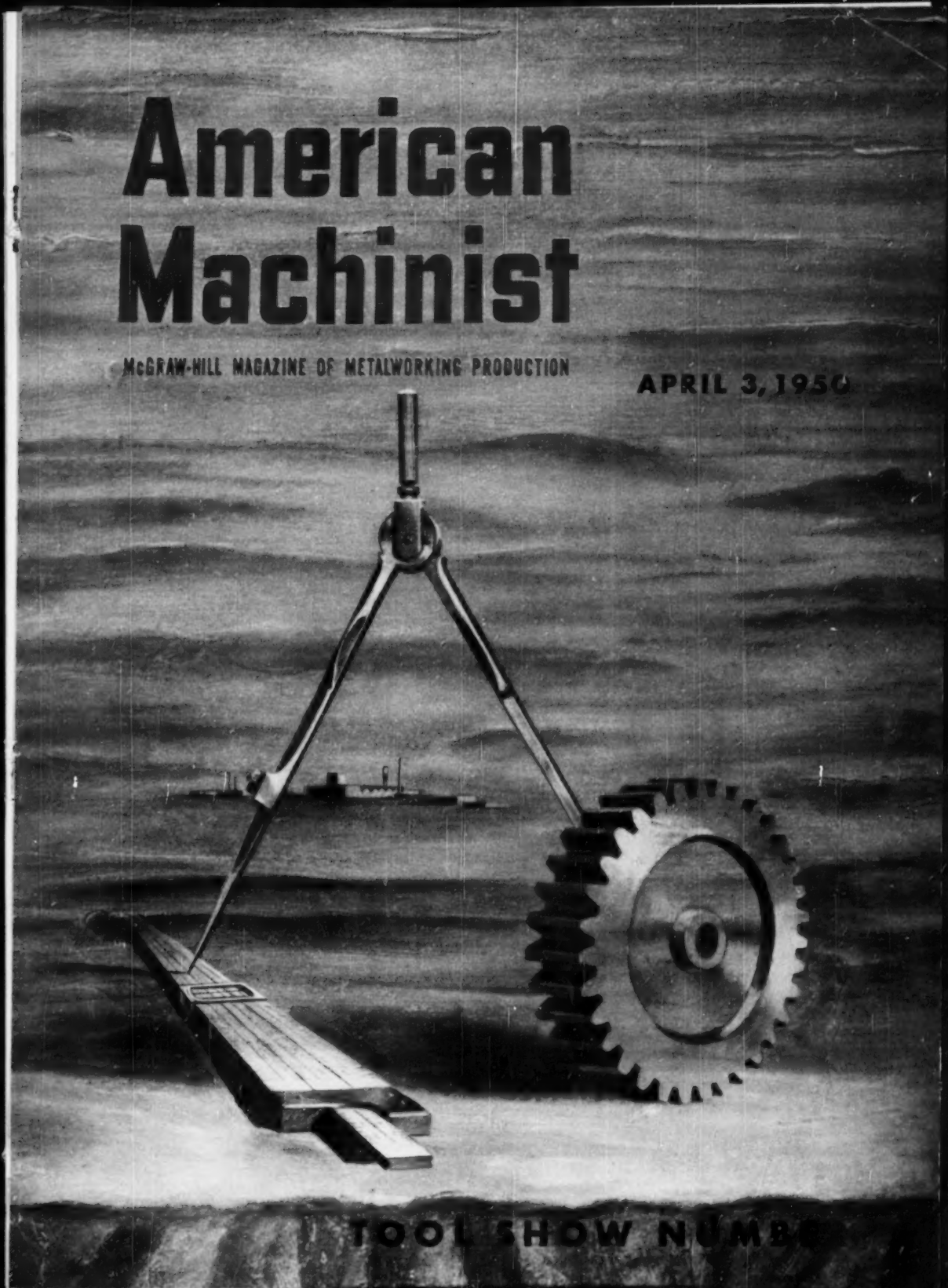
American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

APRIL 3, 1950



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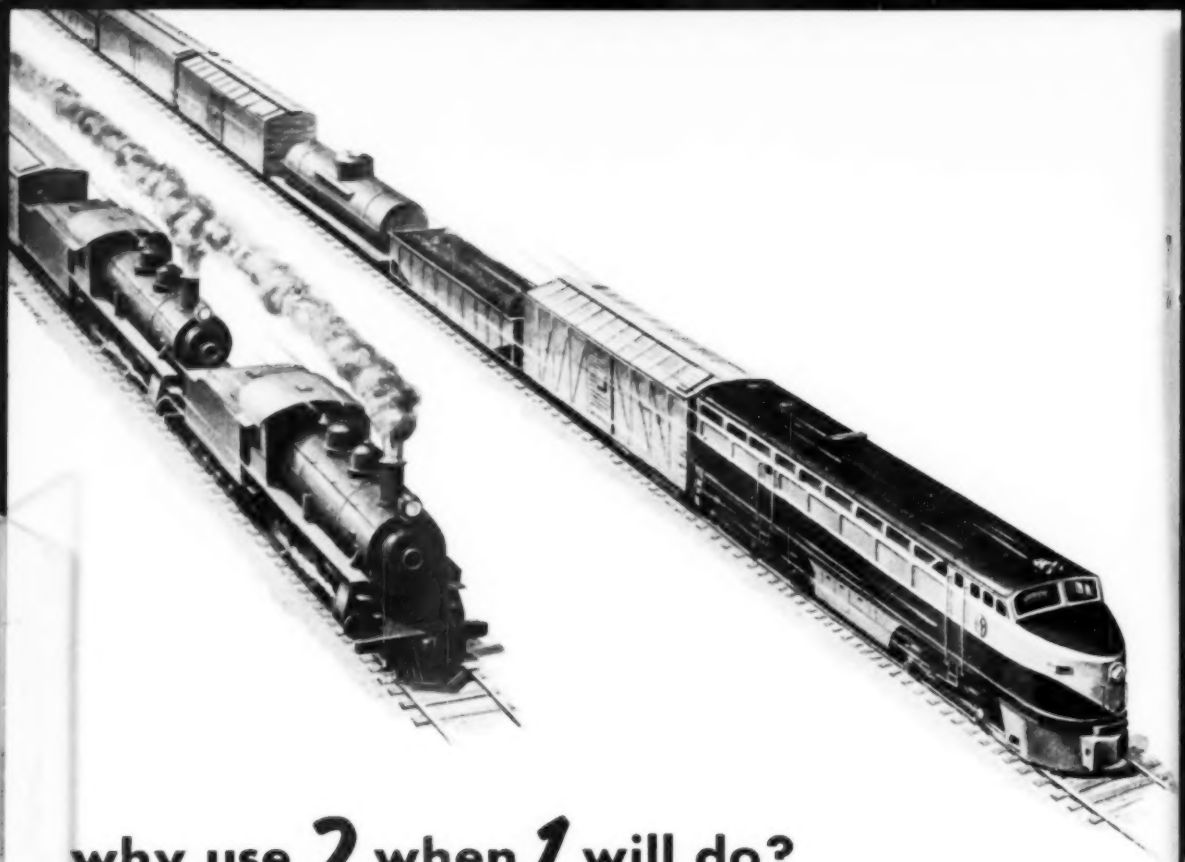

why use 2 when 1 will do?

one Heald 321 Bore-Matic now does the work of two older types of machines

Today, more than ever before, a machine is judged by its capacity to do work efficiently. And when a new Heald machine can take the place of two others, the latter are definitely "dated" — regardless of their year of manufacture.

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Rocker Arms produced twice as fast on a Heald Model 321 Bore-Matic — by combining operations to eliminate extra manufacturing steps. The parts are precision bored and chamfered, two at a time, in a special two-station fixture with rapid hand cam clamping. The complete cycle is fully automatic. All the operator has to do is load and unload the parts and press the start button.

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Published every other Monday. Price 50c per copy. Allow ten days for change of address. Subscription in U.S. United States and possessions, $5 a year, $7 for two years, $10 for three years. Canada, $7 for one year, $11 for two years, $14 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N.Y., under the act of March 3, 1879. Printed in U.S.A. Return postage guaranteed.

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index.

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PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y.
Cables: "McGRAW-HILL, NewYork"

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Chips and QUIPS

Tool Engineer . . . We asked one of our staff artists, Theodore Van Gorp, to do a very special modern painting to cover this issue. The idea was to combine the concepts of the tool engineer as the bridge between design and production and that of a man with his feet on the ground but with his head in the clouds. "Van" symbolized the tool engineer by dividers, the design engineer by a slide rule, and the shop executive by a gear, put a plant in the distance, and created a modern background by coloring over a patterned surface created by putting on casein paint. So here is the artist's concept of the man who makes designers' dreams come true—the tool engineer.

High-Angle Milling . . . For the past year, Jones & Lamson has been developing the high-angle milling process, based on experiments at Greenfield Tap & Die Corp. in flute milling. J & L finds slotting, slab and form milling can all be done well this way. Walden Sinawski, cutting tool engineer explains it.

Mold Finishing . . . G. R. Siragusa, president of the Molded Products Corp., explains mold polishing with diamond compound, his example being the mold for the largest one-piece molded part to date. Here's an expensive abrasive used to save money.

Apprentices . . . Pratt & Whitney Tool has been using an apprentice training system like that recommended by the National Machine Tool Builders Assn. R. Carmichael tells how to start.

Tool Show in Print . . . As a preview, guide, and record for those engineers going to the ASTE Industrial Cost-Cutting Exposition in Philadelphia, April 10-14, and a summary for those who can't get there, this issue contains at least 20 pages of Show material. Some 60 or more items of new shop equipment are described in the Show-in-Print section, these being items that have not previously been described in *A.M.*

Then, in a separate 8-page form, we have a list of exhibitors, a floor plan and a list of papers to be presented. The prize, however, for strangers in Philadelphia (and for some Philadelphians) will be the 4-page section on where to eat there. Even old residents insist good eating takes hunting. As we did three years ago at the Chicago Machine Tool Show, we're trying to do the preliminary hunting, to save you time and trouble during the Show.

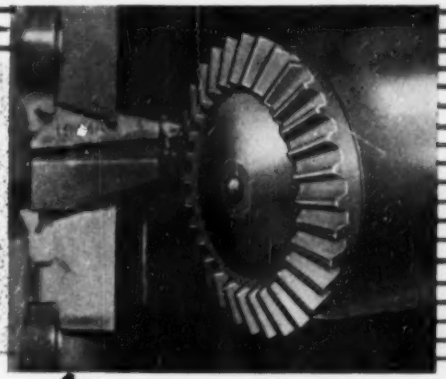
Tooling Emphasis . . . This issue, to acknowledge the Tool Show, is jam-packed with tooling articles. We lead out with descriptions of several uncommon jobs in making parts for typewriters. E. E. Bangs, chief tool designer at L. C. Smith-Corona Typewriter, wrote it for us, shows how special dies and tools cut costs . . . John Lund, supt. of mfg. equipt. & processes, John Deere Co., Waterloo Tractor Works, describes a swivel tool that bores a diesel piston chamber in a J & L turret lathe . . . William W. Johnson, M.E., outlines a procedure for cutting radial V grooves . . . J. R. Paquin, tool engineer at Underwood Corp., continues his popular series with an article on horn dies, showing 18 ideas for various jobs . . . Rupert Le Grand, associate editor, describes tooling a broach for making a variety of parts . . . Anderson Ashburn, associate editor, pictures jobs—other than threading, mostly—that can be done with thread-rolling machines . . . And there's a group of a Talented Tooling pictures, including a riveter converted to a drill, a solenoid pusher for a press, a shop-built bender, and a hand indexing device for groove milling.

Coming . . . April 17 *A.M.* includes a Special Report on powder metals, plus articles on use of air gages, on compound dies, on tooling resistance welders, on training foreign "apprentices" in the U.S., on a tailor-made quality-control system, on hollow-grinding of spud shafts. The cover is an interesting hot-forging shot, taken at Globe Forge, Inc., Syracuse, N. Y.

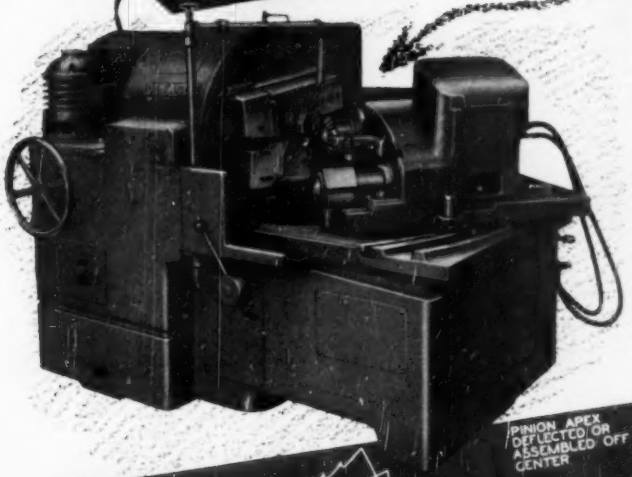
CUTTING TOOL ENGINEER . . . Walden F. Sinawski was born in Springfield, Vt., and has had an itch to travel. In 1936, he came to Jones & Lamson as a cooperative student from the Springfield High School, and upon graduation in 1938 went to J & L full time. After three years of night shift in the shop, he became night supervisor of turret lathes. Four years of that and he was made night general foreman on the Boeing project. When the war ended, he was returned to foreman of the turret lathes, drills, grinders, and associated machines.

In April, 1948, he was transferred to process engineering for a year's training in time study and methods work, and for the past year has been cutting tool engineer. During that period he has done considerable development work on high-angle milling, some examples of which are described in this issue. Mr. Sinawski now lives a few miles from Springfield in Claremont, N. H.

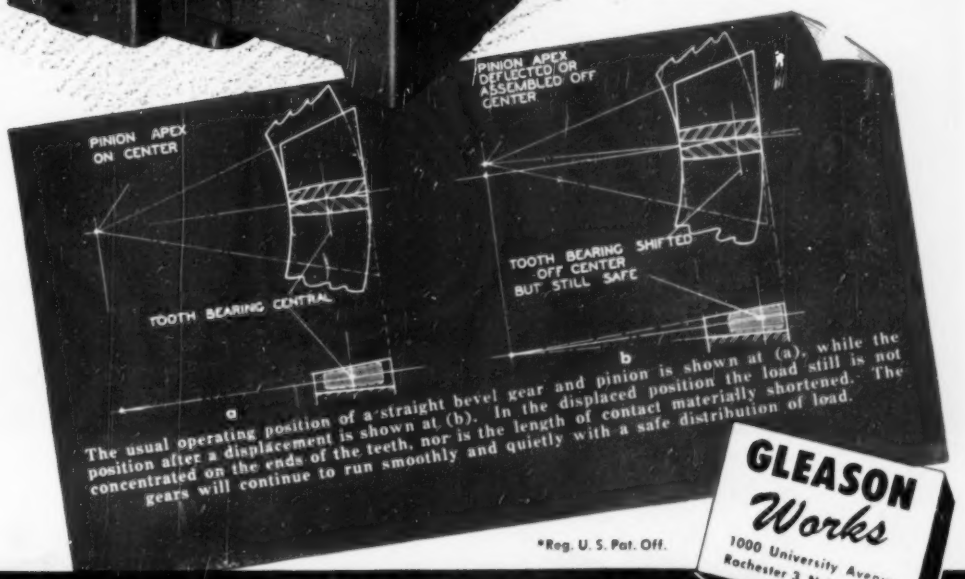
DESIGNED *Especially* FOR CONIFLEX GEAR PRODUCTION



GLEASON
No. 14 STRAIGHT
BEVEL GENERATOR



Coniflex* gears, in the medium sizes, are produced on the Gleason No. 14 Straight Bevel Generator. Completely universal, this machine roughs and finishes Coniflex gears with equal versatility. The Gleason No. 14 Straight Bevel Generator is easier to operate and requires less cutting time than previous models for comparative gears. It also produces a localization of tooth bearing which makes Coniflex the smoother operating, easier assemblying gears with wider operating tolerances. Today, Coniflex gears have proven themselves superior to ordinary straight bevels. In saved assembly time, in superior operation, Coniflex gears are providing daily outstanding performance.



The usual operating position of a straight bevel gear and pinion is shown at (a), while the position after a displacement is shown at (b). In the displaced position the load still is not concentrated on the ends of the teeth, nor is the length of contact materially shortened. The gears will continue to run smoothly and quietly with a safe distribution of load.

*Reg. U. S. Pat. Off.

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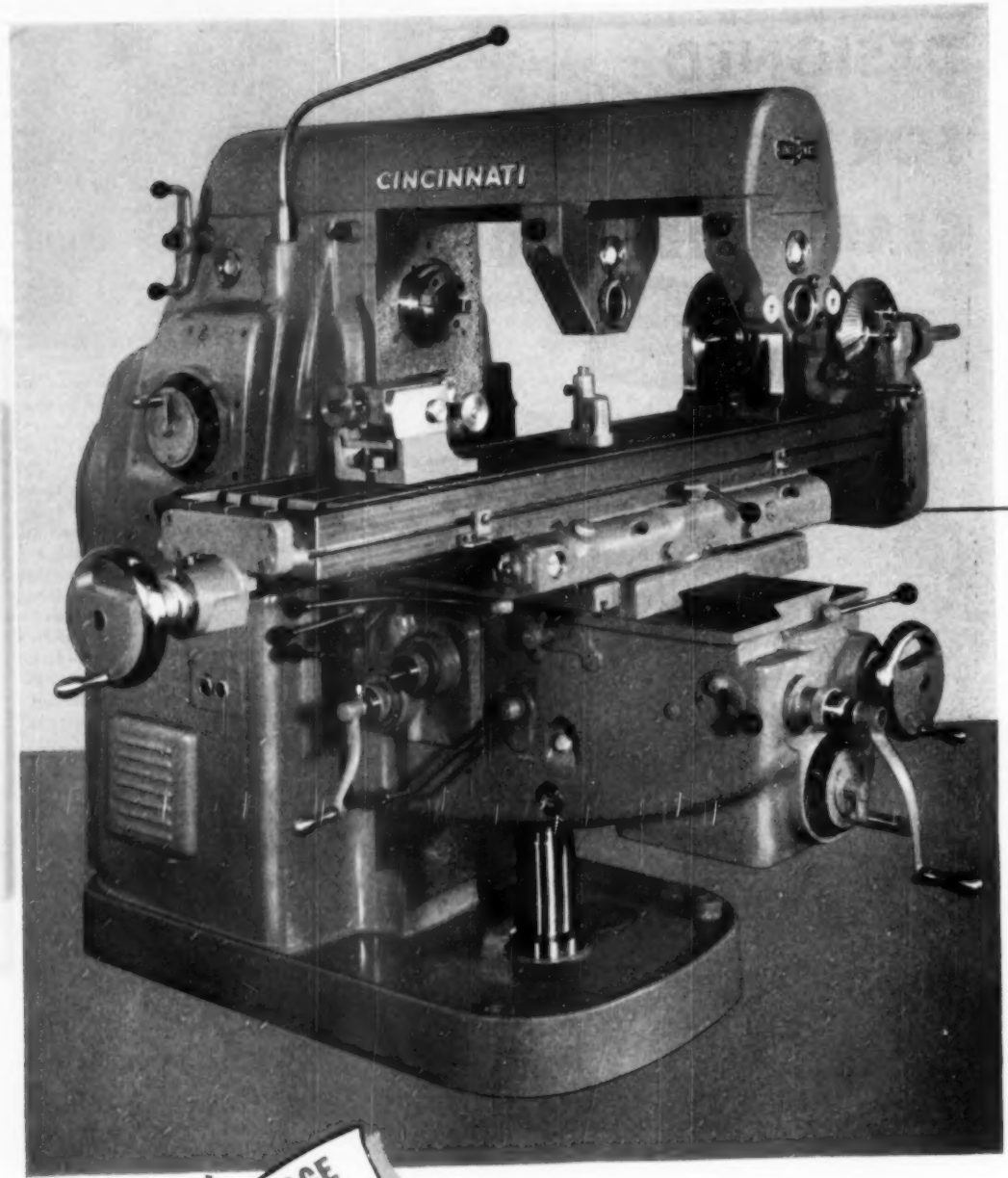

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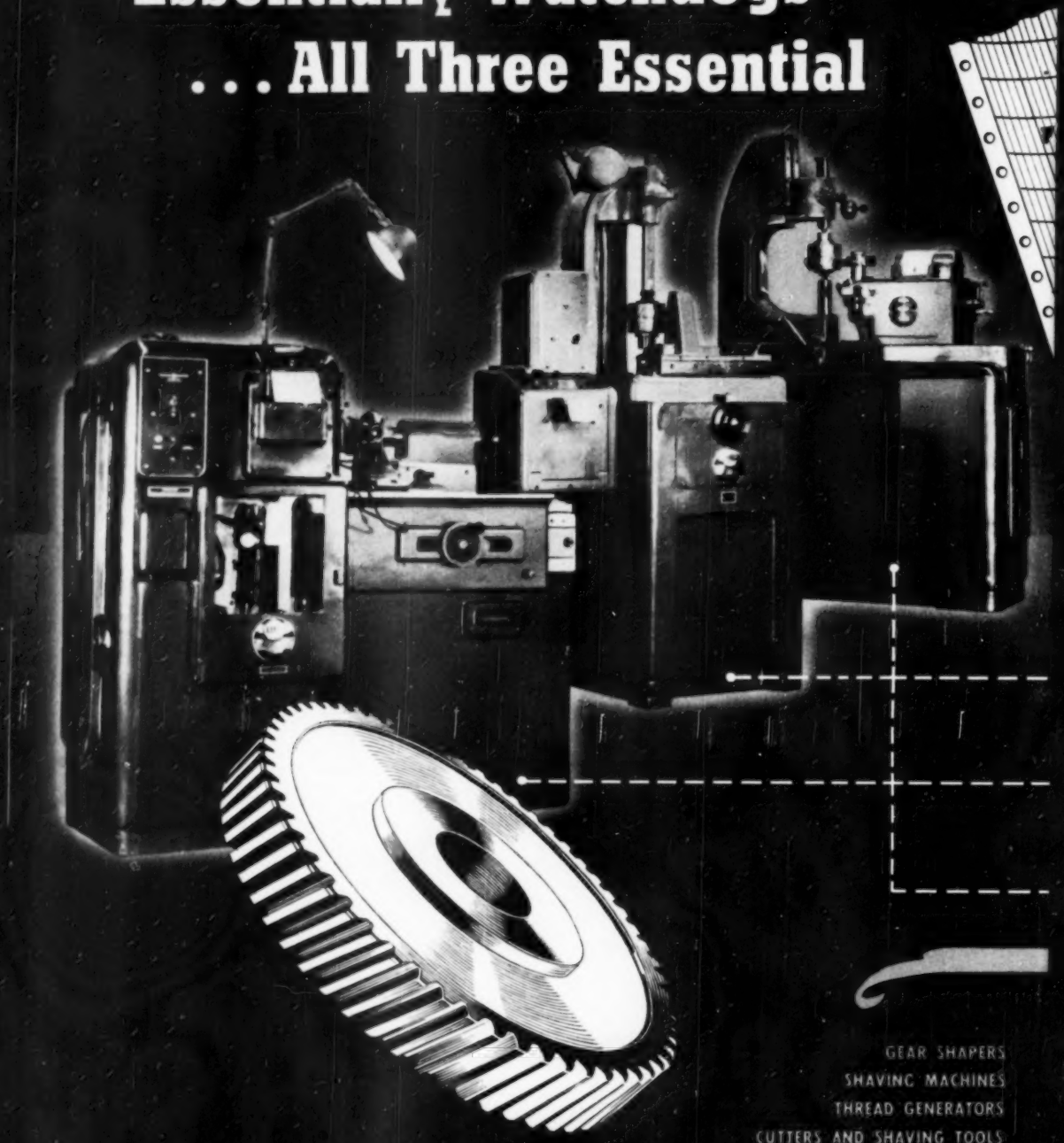

GEAR SHAPERS
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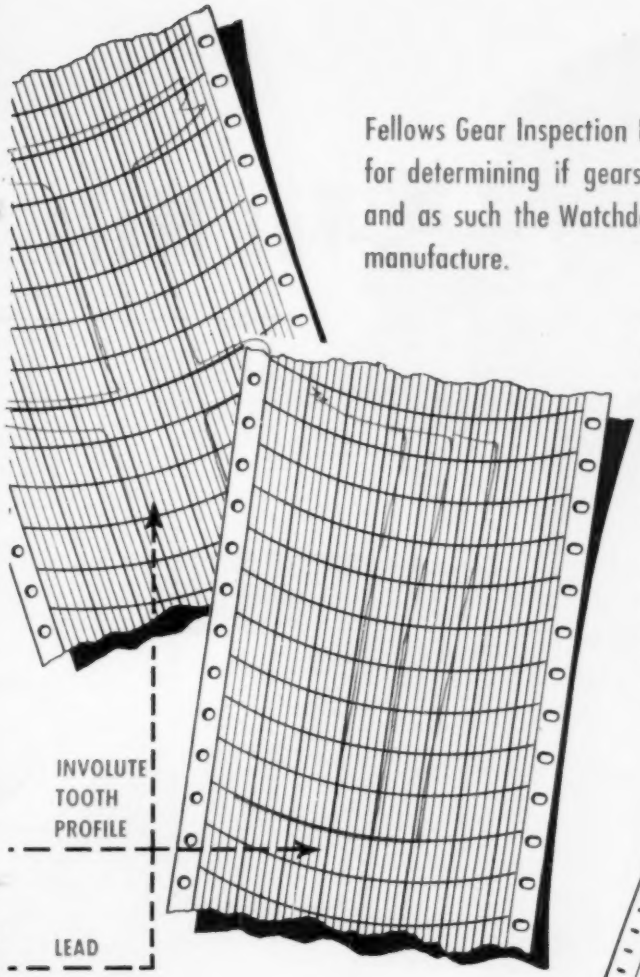

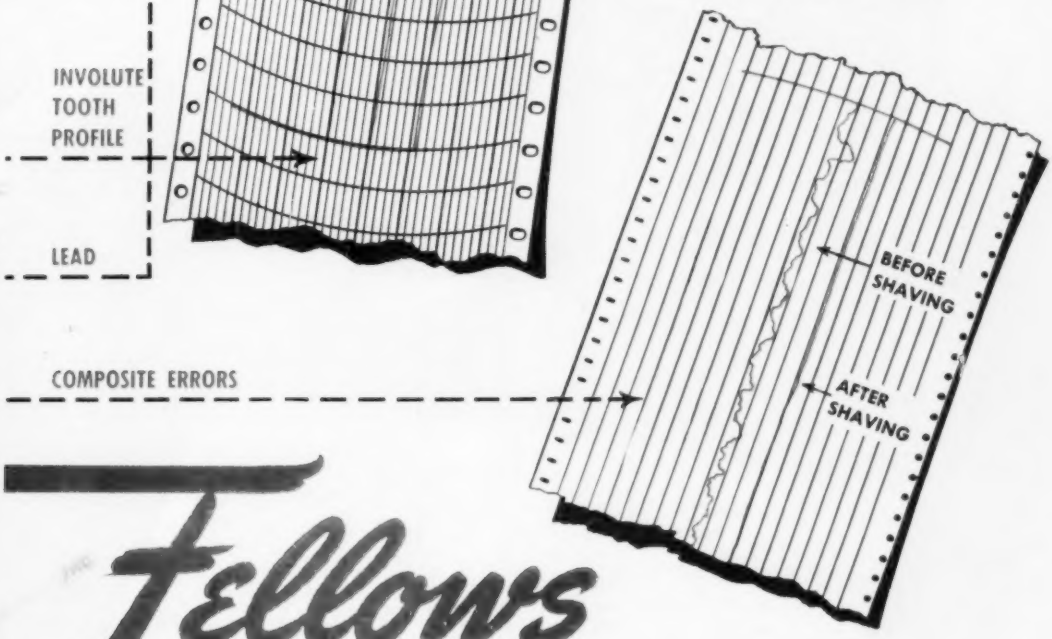

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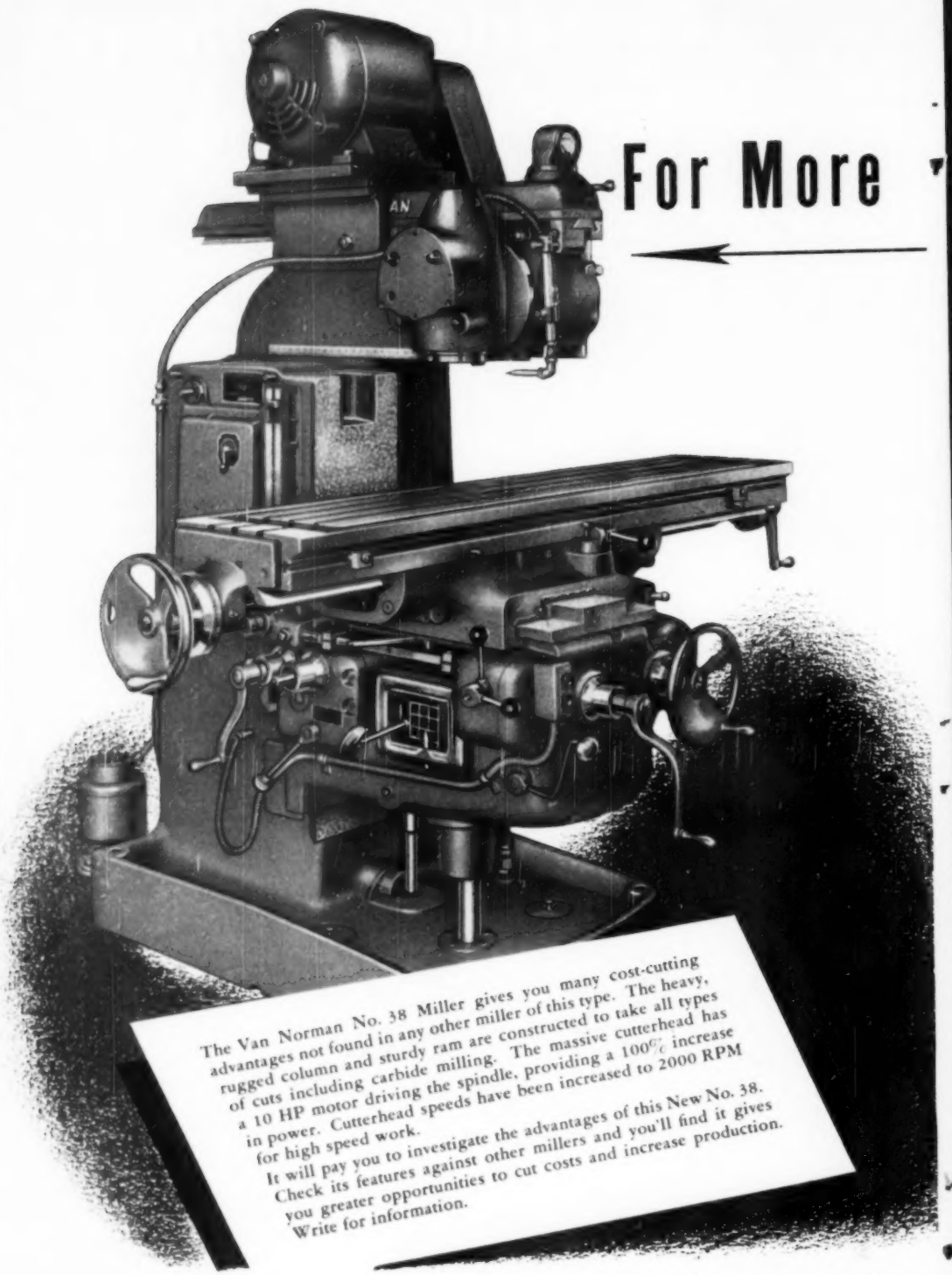


The Van Norman No. 38 Miller gives you many cost-cutting advantages not found in any other miller of this type. The heavy, rugged column and sturdy ram are constructed to take all types of cuts including carbide milling. The massive cutterhead has a 10 HP motor driving the spindle, providing a 100% increase in power. Cutterhead speeds have been increased to 2000 RPM for high speed work.

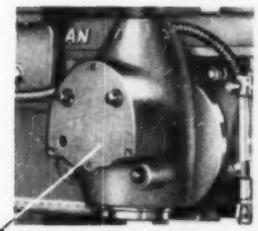
It will pay you to investigate the advantages of this New No. 38. Check its features against other millers and you'll find it gives you greater opportunities to cut costs and increase production. Write for information.

Production Work Hours . . .

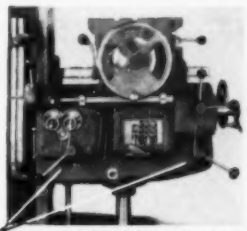
VAN NORMAN No. 38

RAM TYPE MILLING MACHINE

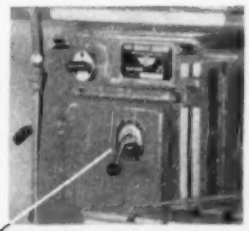
A Heavy-Duty Miller that provides many cost-cutting advantages



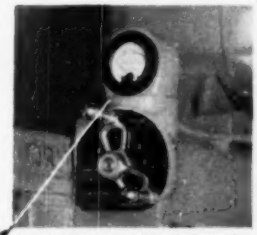
Adjustable Cutterhead permits horizontal, angular and vertical milling on *one* machine. Graduated in degrees for easy positioning.



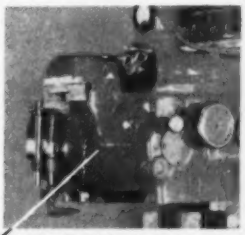
Front and Rear Controls of all power feeds can be operated from either position. Manual controls are also at front and rear.



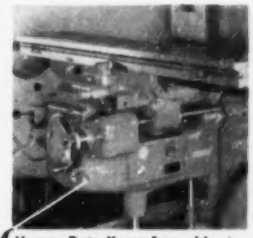
Single Lever Electrical Control controls spindle, feed, and coolant. The same lever reverses spindle direction.



Load Meter is right before the operator's eyes . . . gives visual indication of the "percent of load" that the machine is being operated under.



Massive Ram is heavier and stronger than on other machines. It is reinforced throughout for ruggedness and long life.



Heavy-Duty Knee Assembly, including table and saddle, is designed as an integral unit to provide maximum rigidity and accuracy.

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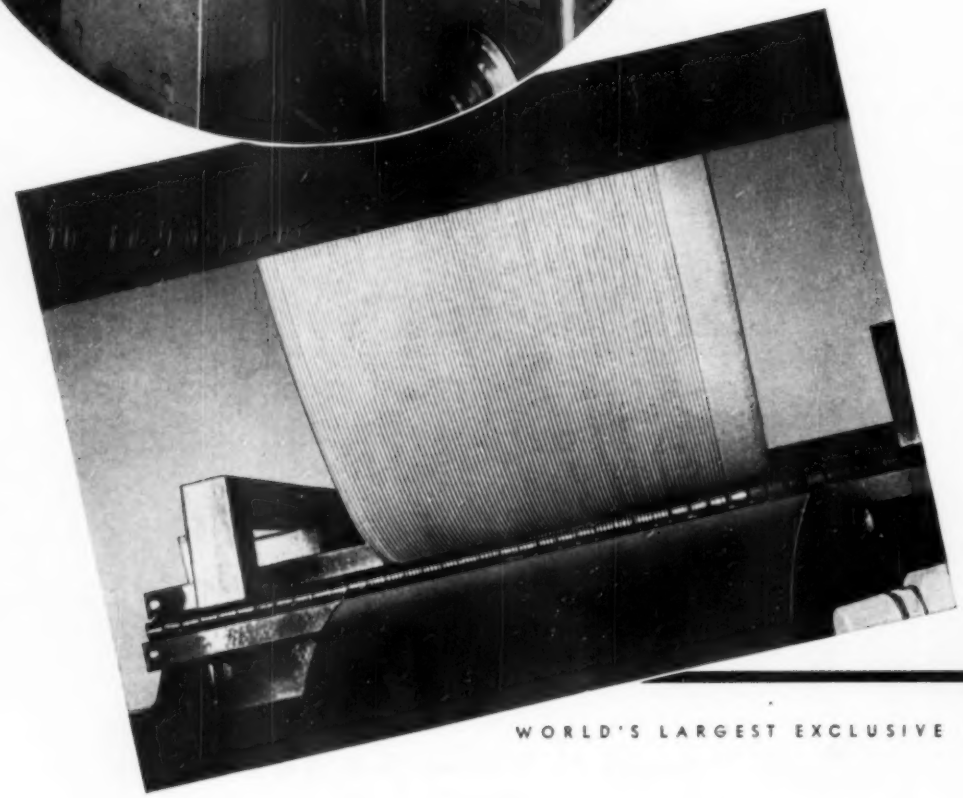
SPRINGFIELD 7, MASSACHUSETTS

MASS of 5,700 BY



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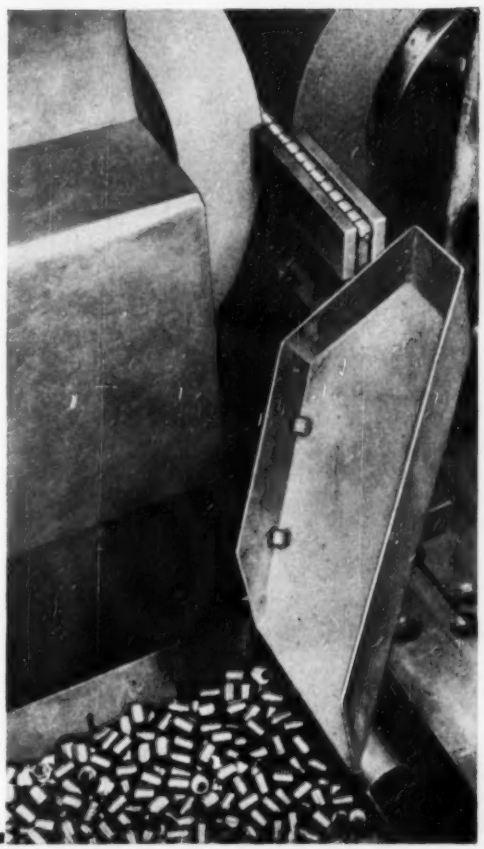
Write for Bulletin E-97



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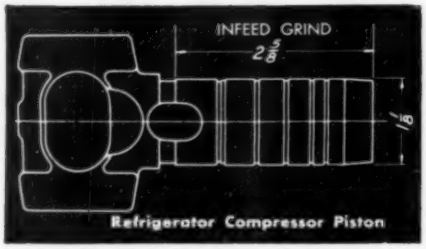
Special Tooling Produces 360 Pieces Per Hour

production	360 pieces per hour
finish	10 micro inches
tolerance	.0003" on diameter



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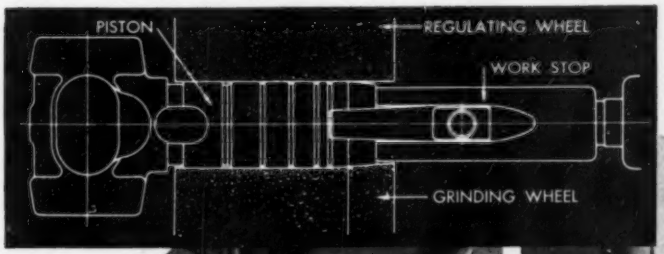
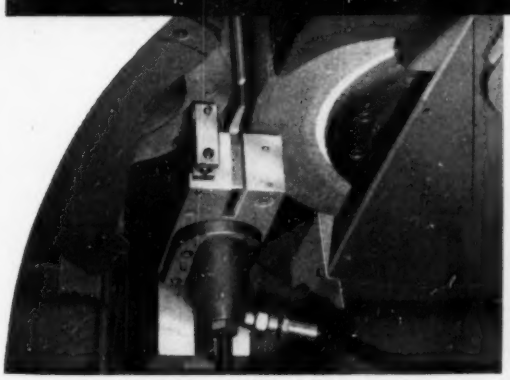
No. 12 Centerless Grinder
Catalog T47

LANDIS TOOL *Precision Grinders*

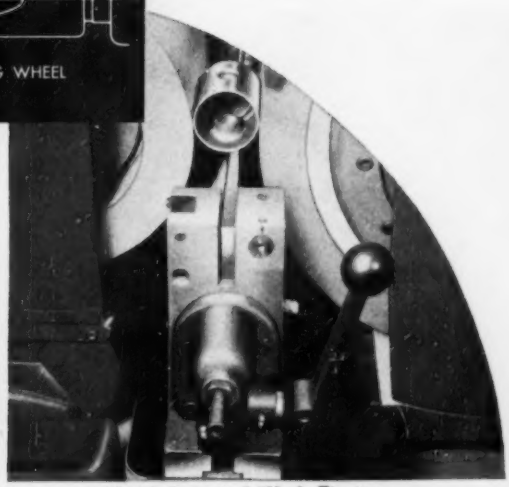
Production estimates and tooling recommendations will be made on the basis of your blueprints.

by Centerless Infeed Grinding

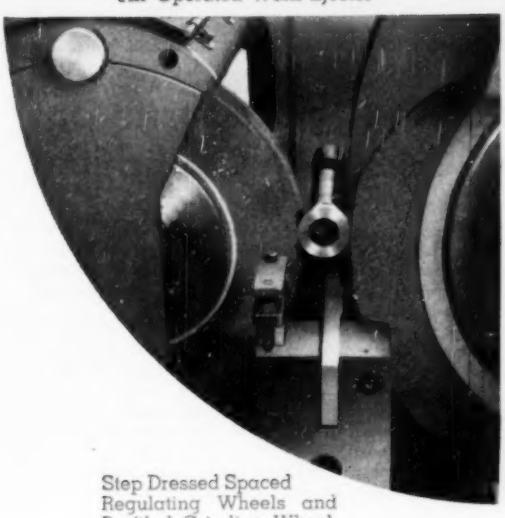




Air Operated Work Ejector



Hand Operated Work Ejector

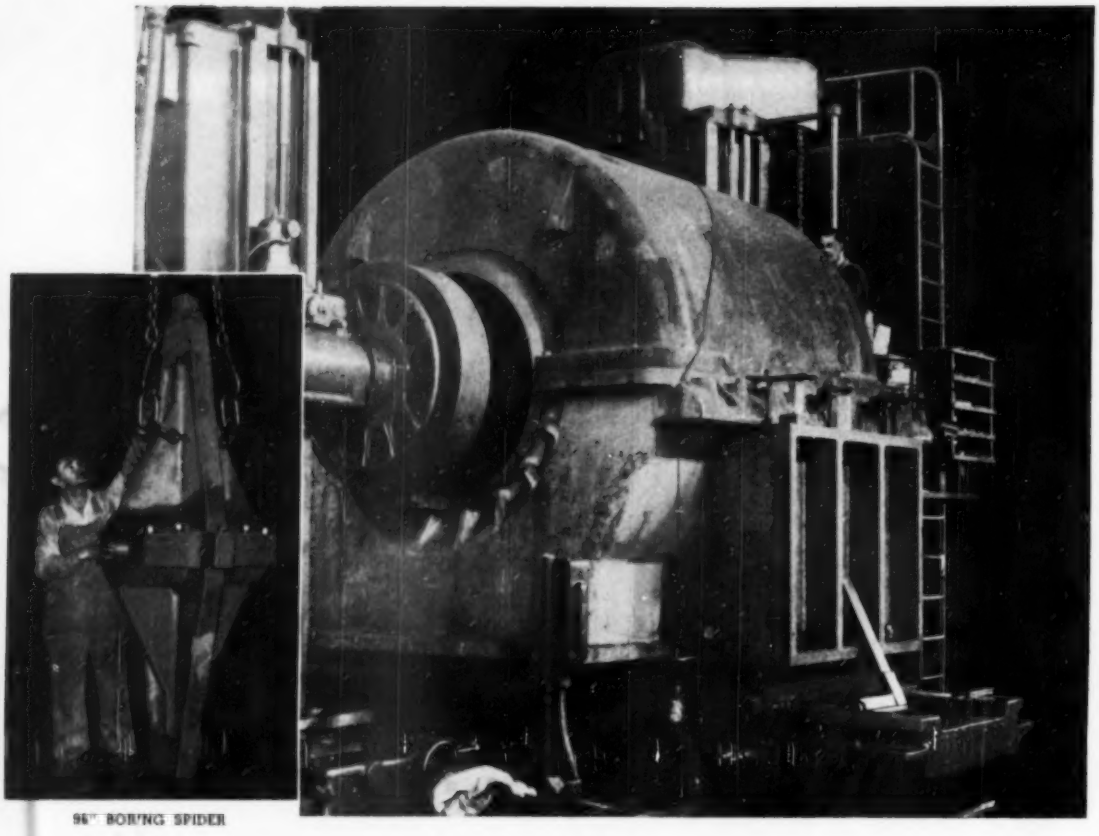


Step Dressed Spaced Regulating Wheels and Profiled Grinding Wheel

Extra Equipment Used When Stepdressing Regulating Wheels

Other Tooling Available for Infeed Grinding Operations

LANDIS TOOL COMPANY / 12 E. SIXTH ST. / WAYNESBORO, PA.



96" BORING SPIDER

7 Diversified Operations Performed in Sequence on 4 - Stage Blower Castings, Using G & L Machine

Following planing of the joining surfaces and drilling of bolt holes in the upper and lower sections of the blower housing, the sections are assembled on the table of the G. & L. Horizontal Boring, Drilling and Milling Machine for this series of operations:

1. Rough and finish machine the cover plate bores, using the continuous feed facing head with carbide-tipped tools.
2. Co-ordinating cross feed of the continuous feed facing head with the machine saddle feed, the internal taper face of the back wall is machined. Square surfaces are also faced.
3. The ends of the counterbore to receive the cover plate shoulder are faced.
4. The facing head is replaced by a special boring spider. This is mounted on a boring bar held in a bar support. Again using carbide tools, the 97½" bores are rough and finish machined, after which the corresponding tongues are roughed and finished.
5. Boring equipment is replaced with a face mill for milling the pads and cutting a 4" keyway at the right hand end.
6. Cover plates are mounted in place and drilled. No layout is required—holes are located by the co-ordinate method.
7. The casting assembly is turned end for end, and Operation 5 is repeated at the opposite end.

GIDDINGS & LEWIS
FOND DU LAC

G & L CAPACITY PRODUCES 8′ BORE, INTERNAL TAPER

and other cuts on huge blower housing

TABLE TYPE HORIZONTAL BORING MACHINE WITH ACCESSORIES HANDLES DIFFICULT OPERATIONS

The range and variety of operations which can be performed profitably on a G. & L. Horizontal Boring, Drilling and Milling Machine are illustrated by this interesting job.

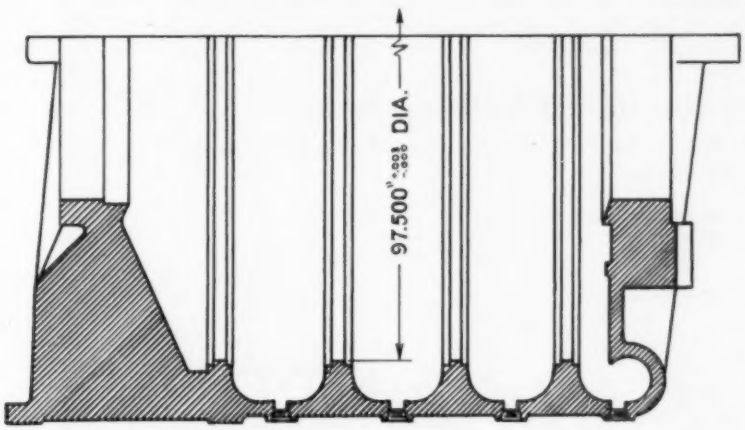
Here, the upper and lower sections of the housing for a large 4-stage centrifugal blower require boring in several diameters (including one of 97½"), counterboring, internal facing (both straight and tapered), milling and drilling. In all, 7 operations are handled in sequence on the G. & L. — *with greater speed, accuracy and squareness of assembly* than obtained by former machining methods.

The many different machining jobs performed on this casting are made possible by the combination of movements available in the G. & L. table type machine, plus the extended range provided by accessories and attachments. Internal taper facing, for example, is obtained by means of the continuous feed facing and boring head, co-ordinated with the machine saddle movement. The 97½" bore is machined with the aid of a special boring head mounted on a boring bar, held in a bar support.

Set-ups are made by means of precision measuring equipment on the G. & L. machine. No layouts are employed on any of the operations—machining accuracy does not depend entirely on the skill of the operator.

SOLVE YOUR PROBLEMS WITH A G&L

Both small and large parts—manufactured singly, in average lots, or mass produced—are being machined efficiently on G. & L. horizontal boring machines in many industries. With attachments and accessories, there is practically no combination of operations that cannot be performed with speed and economy. Feeds and speed ranges cover practically any cutting requirements. Analyze your production problems—learn how they can be solved to better advantage on a versatile G. & L.!



Engineering
ASSISTANCE

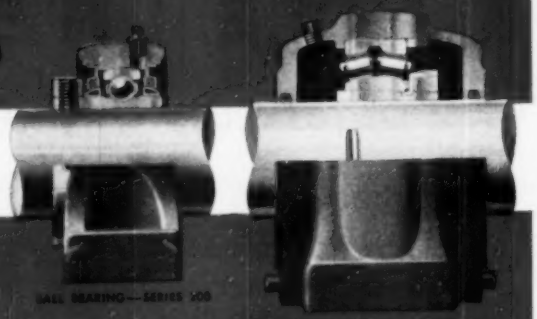
Without obligation, competent G. & L. engineers will gladly co-operate in determining how your work can be completed faster and better. Send complete details and prints if available. Unbiased recommendations will be made.

Free
LITERATURE

Get the full story on G. & L. Horizontal Boring, Drilling and Milling Machines and accessories—write now for your copy of Bulletin 50-T48.

MACHINE TOOL COMPANY
WISCONSIN U. S. A.

Lock a LINK-BELT Ball or Roller Bearing to your shaft



BALL BEARING—SERIES 200

ROLLER BEARING—SERIES 4000

without distortion

because . . . the set screws are not threaded into the inner ring of the bearing. The spring-locking collar, or the tapered sleeve, clamps the bearing to the shaft.

with firm grip

because . . . of the "hoop tension" of the spring-locking collar, or the tight grip of the tapered sleeve.

without mislocation

because . . . the spring-locking collar is factory assembled and permanently located in correct position on the bearing.

regardless of rotation

because . . . of symmetrical locking. Two simple operations securely lock a LINK-BELT bearing. Simply slip on shaft; then tighten two set screws, or pull up the locknut.

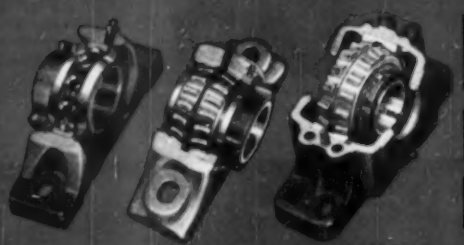
with wide distribution of bearing load

because . . . the wide inner ring of the bearing, or the tapered sleeve, provides a large area of shaft contact.

May we send you the new Link-Belt Ball and Roller Bearing Catalog No. 2550, containing complete data useful in design and replacement? Link-Belt engineers are quickly available to discuss your bearing problems. Contact the nearest office.

LINK-BELT COMPANY Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities. H1.350

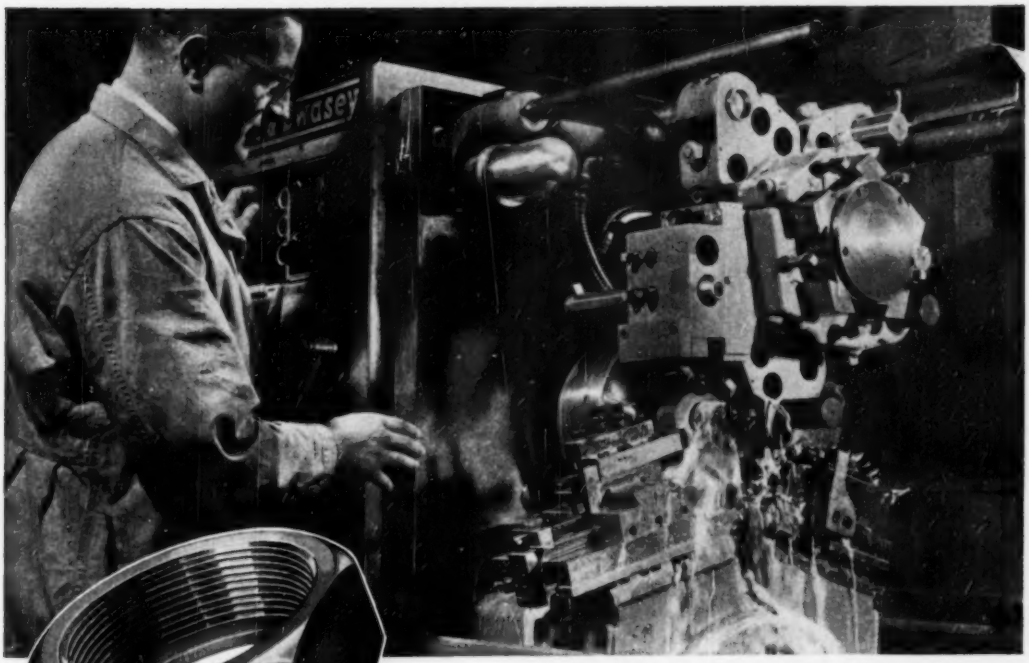
A complete line of bearings is available from stock, throughout the country, in pillow blocks, cartridge, flanged cartridge, flanged, hanger and takeup blocks—also unmounted bearings.

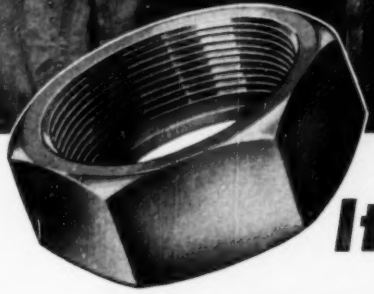


LINK-BELT

BALL & ROLLER

BEARINGS





It's STAINLESS...

but Stainless Engineering upped production 220% on a Warner & Swasey Single Spindle Automatic

LOCATION: Stainless Engineering and Machine Works, Division of Cooper Alloy Foundry Company, Hillside, New Jersey.

MACHINE: The new Warner & Swasey 1-AC Single Spindle Automatic Chucking Machine. 10″ Air Chuck.

PART: Cast Type 316 Chromium-nickel stainless steel Valve Nut.

OPERATIONS: Bore, ream, chamfer, back chamfer, and tap 3″-12 pitch thread with collapsing tap.

METHOD: Standard tools.

RESULT: **Floor-to-floor time down 69%.**
Production up 220%.
More uniform parts.
No additional setup time required.
Costs per part *reduced* substantially.

Stainless Engineering has found the Warner & Swasey 1-AC Single Spindle Automatic an excellent answer to their production problem. Why not see how the 1-AC can turn out *your* production faster. Call your nearest Warner & Swasey Field Representative or write . . .

to set up a Warner & Swasey CAMLESS Automatic!

WARNER & SWASEY
Machine Tools
Cleveland

Turret Lathes, Multiple & Single Spindle Automatics, Precision Tapping and Threading Machines

It Cuts . . It Smooths . .

AT PHILADELPHIA — AT CLEVELAND

See for yourself how the new NORTON REINFORCED Hub Wheel can save you money. See it in action at the Tool Show and Foundry Show.

Now you can Cut, Rough Grind and Finish Grind with the Same Wheel!

STRONGER and SAFER

Comparison will convince you that the new NORTON REINFORCED Hub Wheel is a stronger, safer wheel for use on your right-angle portable grinders and sanders. Layers of strong, fibrous material, plus a special safety web molded into the back of each wheel, prevent it from flying apart in use even though accidental breakage should occur.

FASTER CUTTING

Comparison will convince you that this new Norton wheel cuts as fast, and often faster than other wheels of similar type. It cuts fast and clean without spalling and loading, because it contains sharp, durable ALUNDUM abrasive, a special resinoid bond and has a unique file-like cutting surface.

LONGER LIFE

Comparison will convince you that you get longer, more economical life with a NORTON REINFORCED Hub Wheel — the strongest, most durable wheel of its type on the market. Many plants have discovered that this wheel lasts two to three times longer than wheels used previously.

VERSATILE

And comparison will prove to you that this wheel is really versatile. Now you can rough and finish grind with the same wheel — ***and you can notch with it too!***

Rough grinding heavy weld bead prior to finish grinding with same wheel.

Notching risers on ferrous casting prior to knocking off with sledge.

Smoothing surface of large brass casting. Note how easily wheel gets into corner.

NORTON ABRASIVES

Make the comparison in your shop. Contact your Norton abrasive engineer or distributor for full details, or write for your free copy of the folder on "NORTON REINFORCED Hub Wheels".

W-1288

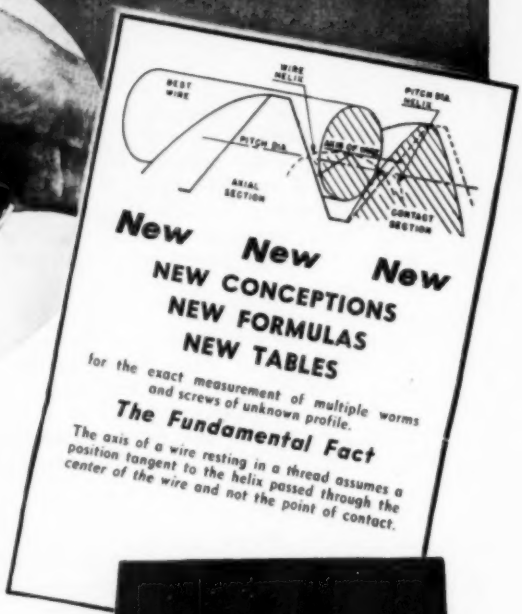
NORTON COMPANY WORCESTER 6, MASS. Warehouse and Sales Service Stocks in All Principal Cities

Van Keuren MEASURING WIRES

STANDARD EQUIPMENT

...everywhere

Measuring the pitch diameter of a 1"-8 National Form thread gage. This method is recommended by the Bureau of Standards.



New New New

NEW CONCEPTIONS
NEW FORMULAS
NEW TABLES

for the exact measurement of multiple worms and screws of unknown profile.

The Fundamental Fact

The axis of a wire resting in a thread assumes a position tangent to the helix passed through the center of the wire and not the point of contact.

Van Keuren Measuring Wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, hobs, worms, splines and gears. Reputable manufacturers of ground taps and thread gages used for the production and acceptance of threaded holes and nuts use Van Keuren Measuring Wires. You will seldom find them in error if you, too, have Van Keuren Measuring Wires.

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request.

Set No. 20 Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded parts.

Price, High Speed Steel Wires $ 95.00
Price, Carboloy Wires 240.00

Special wires from .002" to 2.000" diameter are made to any tolerance required.

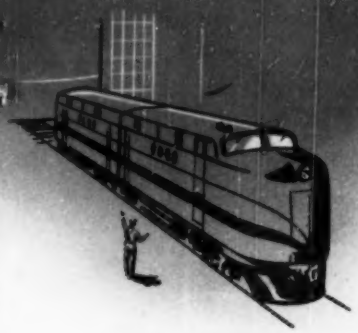
THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

31st YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

90 minutes...

TO COMPLETELY FINISH TURN THIS LOCOMOTIVE AXLE!

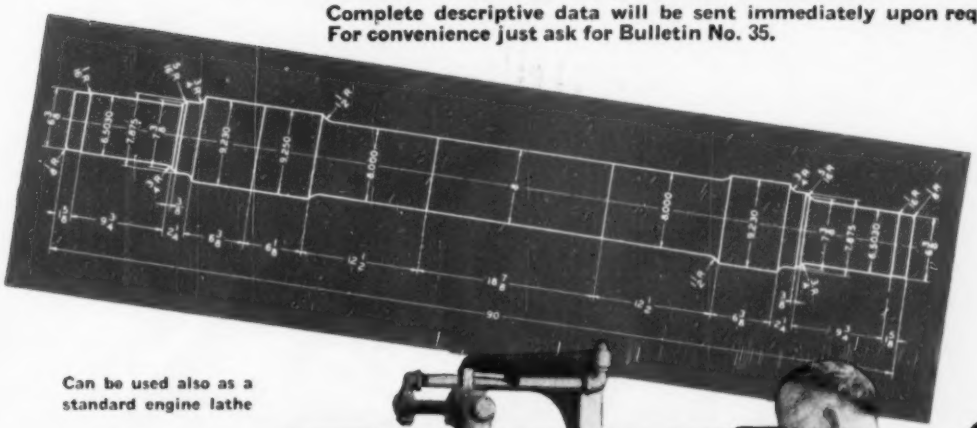


It usually takes about 8 hours to do this job. A saving of 6½ hours to finish this axle is a real saving in any railroad shop.

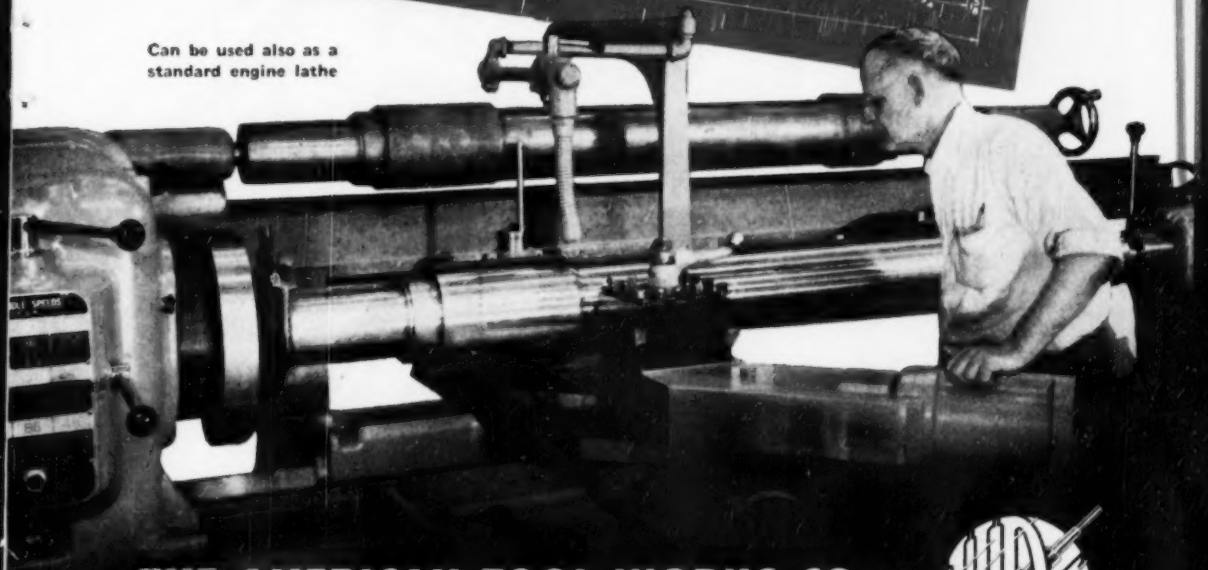
It proves conclusively that the new "American" Hydraulic Duplicating Lathe is a positive answer to lower costs in the railroad shops.

The new 25-inch "American" Hydraulic Duplicator on which this job was done has the enormous power, the unfaltering stamina and the ease of control which combine to make it the production marvel of the moment. Cost-minded executives from every quarter of this country and from many countries abroad have shown vital interest in this new machine. Many orders already have been placed and many machines now are in service breaking production records daily.

Complete descriptive data will be sent immediately upon request. For convenience just ask for Bulletin No. 35.



Can be used also as a standard engine lathe

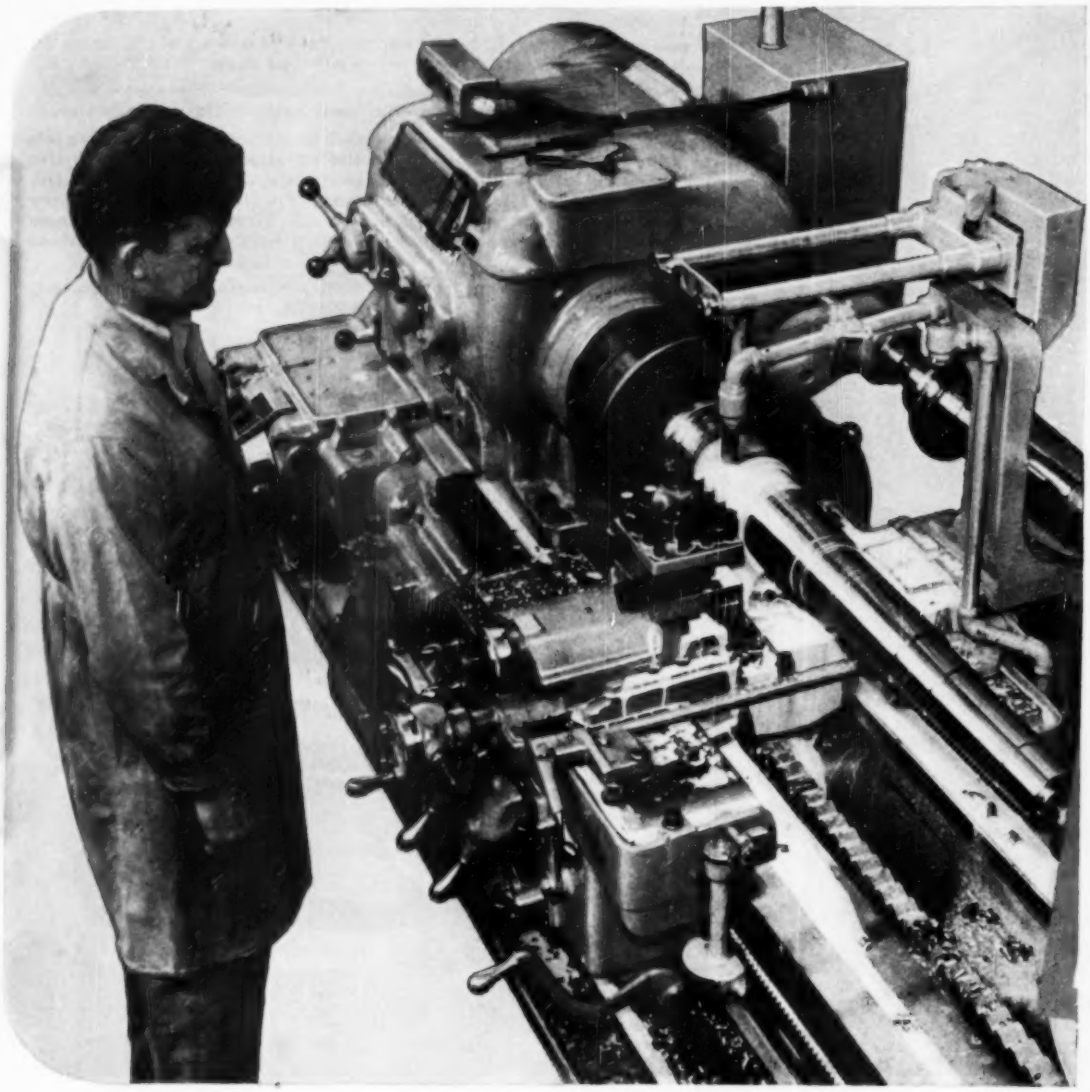


THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Cut Cutting Costs with

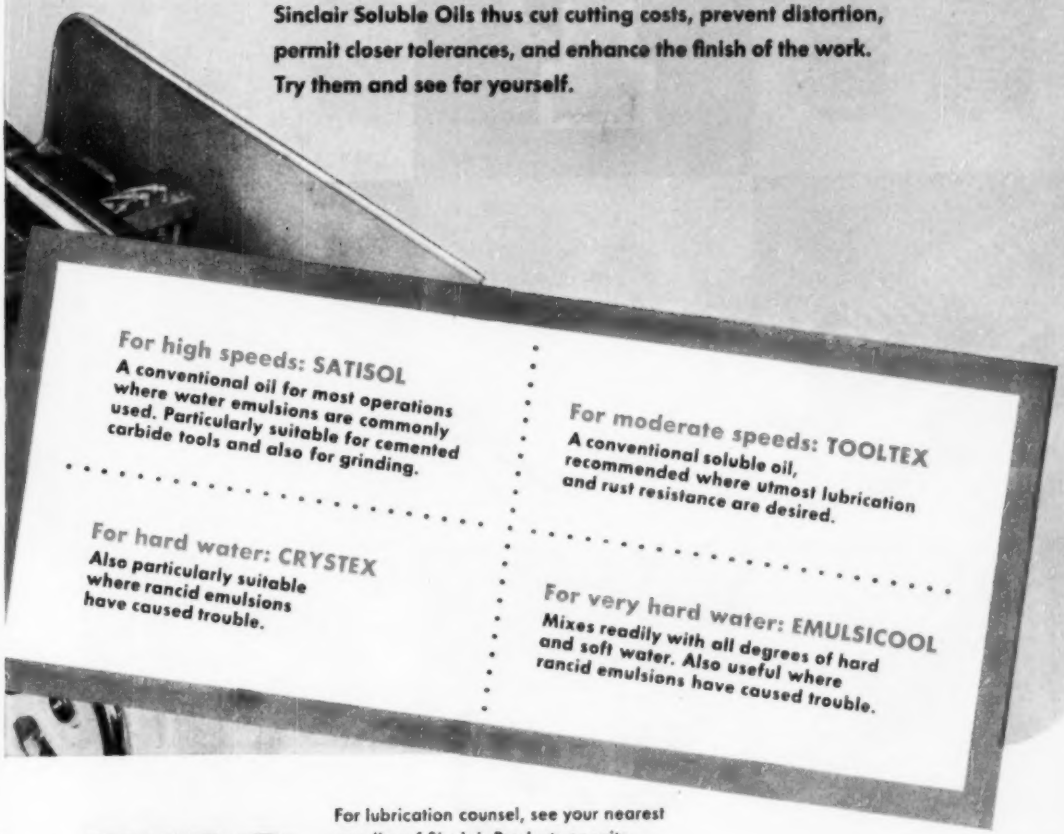


SINCLAIR INDUSTRIAL

Sinclair Soluble Oils

You can make a big cut in your cutting fluid bills by shifting, wherever practicable, from cutting oils to Sinclair Soluble Oils. These mixtures provide a white, non-foaming, odorless, stable emulsion with high cooling qualities. Moreover, they thoroughly wash away chips on machine surfaces. And they prevent heat build-up on the machine because they won't form gummy deposits.

Sinclair Soluble Oils thus cut cutting costs, prevent distortion, permit closer tolerances, and enhance the finish of the work. Try them and see for yourself.



For high speeds: SATISOL
A conventional oil for most operations where water emulsions are commonly used. Particularly suitable for cemented carbide tools and also for grinding.

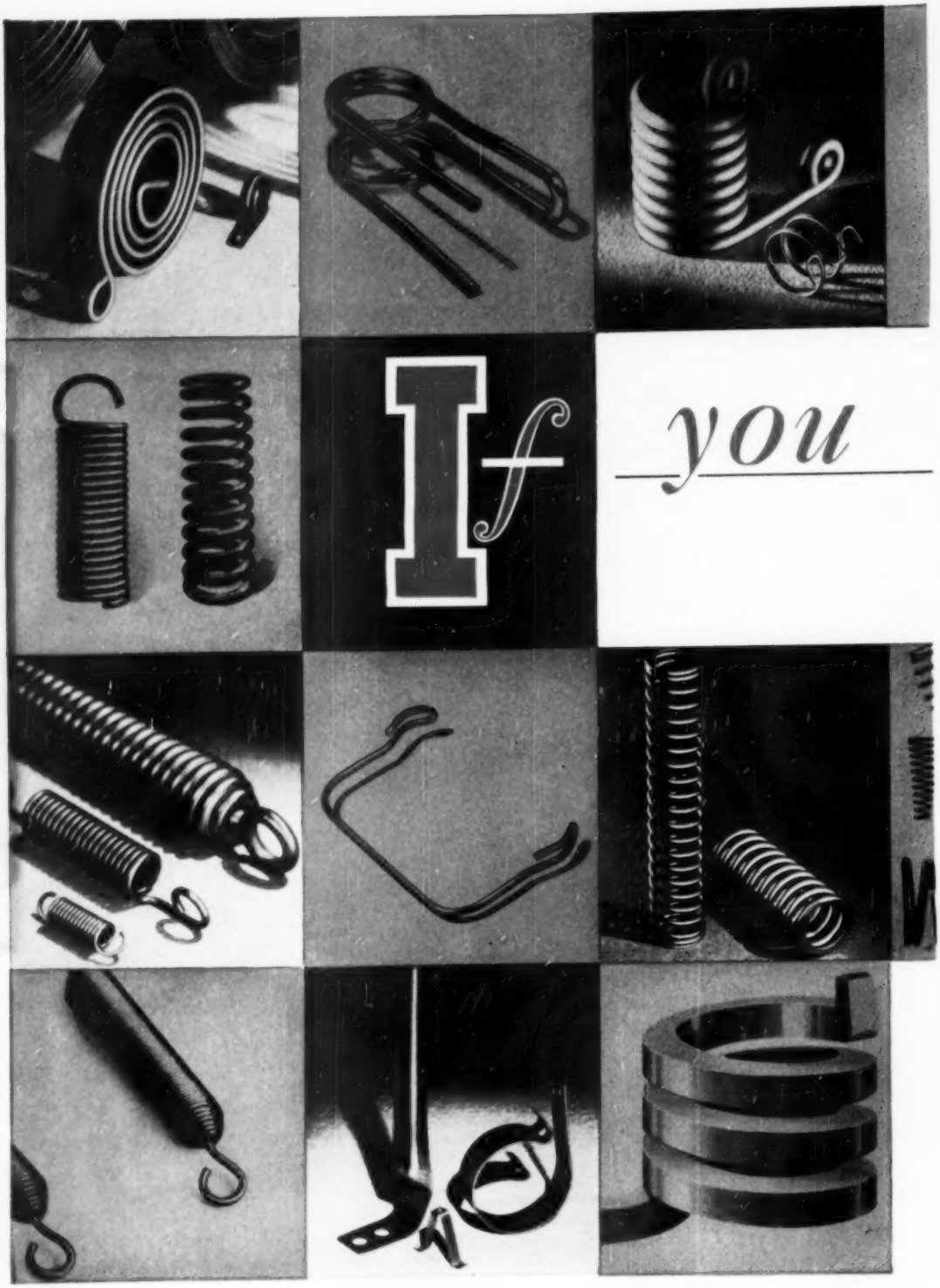
For hard water: CRYSTEX
Also particularly suitable where rancid emulsions have caused trouble.

For moderate speeds: TOOLTEX
A conventional soluble oil, recommended where utmost lubrication and rust resistance are desired.

For very hard water: EMULSICOOL
Mixes readily with all degrees of hard and soft water. Also useful where rancid emulsions have caused trouble.

OILS

For lubrication counsel, see your nearest supplier of Sinclair Products or write Sinclair Refining Company, 630 Fifth Avenue, New York 20, N. Y.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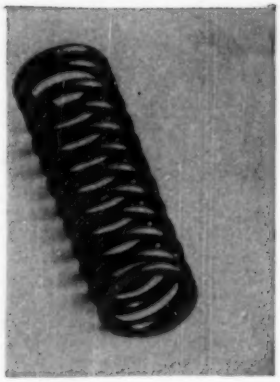
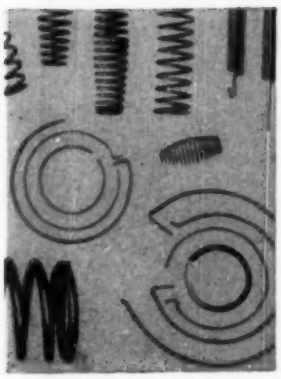


use springs

...then this is for you!



● There is only one place where spring performance can be judged accurately. In service! That's where your choice of spring material spells the difference between bristly tempers and customer satisfaction.

While we can't advise you on the way to handle the *complaints* about spring failures, we believe we can give you some sound advice on how to *minimize* failures. And that is—*install American Quality Springs.*

In automobiles . . . farm equipment . . . alarm clocks . . . phonographs . . . typewriters . . . window shades and hundreds of other products, American Quality Springs have done an outstanding job. They have withstood extreme temperature changes. They've given years of faithful service under high stresses. They've been subjected to severe corrosive conditions and have come through with flying colors. And they've given admirable performance in applications where exceptionally close tolerance precision and unfailing uniformity were imperative.

In helping you work out your spring problem we offer the services of highly-trained spring engineers who keep in touch intimately with the latest metallurgical developments. And we place at your disposal production and testing facilities that are generally regarded as the finest in the country. Contact our nearest office or 408 Rockefeller Building, Cleveland 13, Ohio.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS **AMERICAN QUALITY SPRINGS**

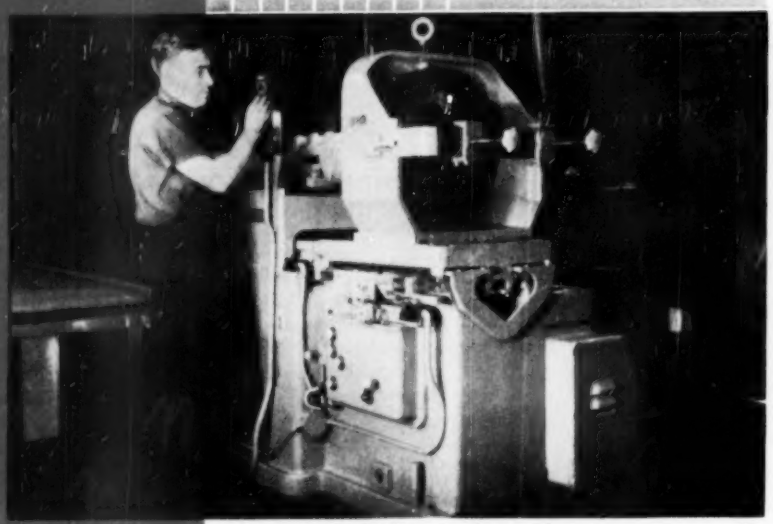
UNITED STATES STEEL

PRODUCTION has INCREASED
MACHINING QUALITY is IMPROVED

Accuracy is Held Closer
Set-up Time is Reduced

SINCE REPLACING A CONVENTIONAL MOTOR WITH

Century SELECTIVE SPEED Drive ON THIS BORING MACHINE



Two separate Speed Selector Controls are used for this automatic 2 cutting speed operating cycle.

This is just one typical example of the time and labor-saving advantages which may be incorporated in new machines—or which may be installed on equipment now in use.

Century SELECTIVE SPEED Drives have been operating as long as 25 years in such places as steel mills, rubber mills, paper mills, wire mills, printing plants and machine shops. These drives are ideal wherever production processes require a wide range of stable speeds.

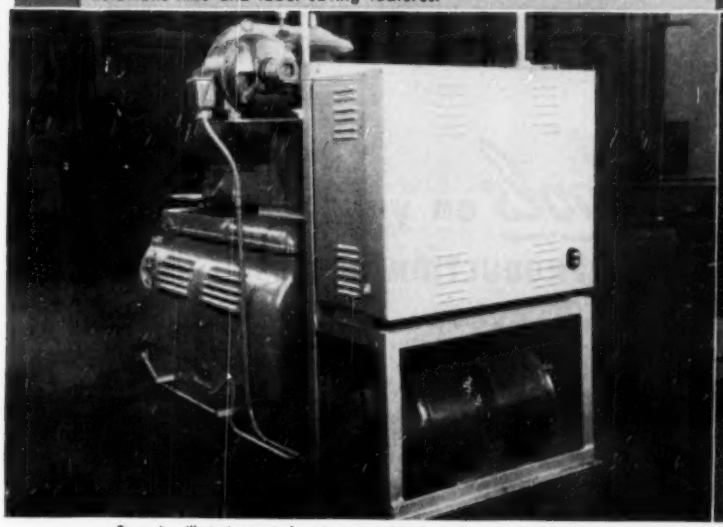
ANY COMBINATION OF THE FOLLOWING FEATURES MAY BE COMBINED IN Century SELECTIVE SPEED Drives

FROM 1 TO 150 HORSEPOWER

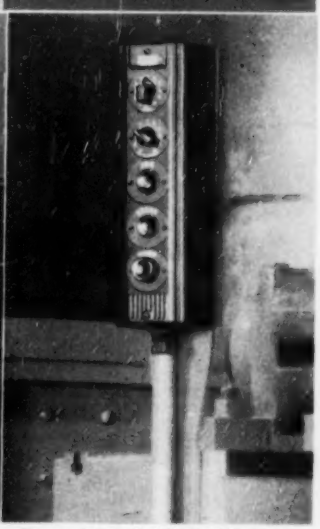
1. **WIDE RANGE AND SPEED VARIATION**—8 to 1 ratio is a standard—Up to 32 to 1 is available.
2. **PRACTICALLY STEPLESS SPEED CONTROL**
3. **STABLE SPEEDS**—Even with varying loads.
4. **JOGGING CONTROL**—Jogging at preset speed is always available.
5. **PRESET SPEED CONTROL**—Automatically accelerates to speed preset by the control.
6. **DYNAMIC BRAKING**—For quick automatic stopping or for controlled deceleration of load.
7. **REVERSING OPERATION**—Jog in reverse, or run in reverse, or both as specified.
8. **MULTIPLE DRIVING UNITS**—With related speeds controlled from a single location.
9. **CONTROL LOCATION**—"Start"—"Stop"—"Jog"—"Reverse" or change in speed may be controlled from any number of locations.
10. **REMOTE CONTROL**—Control accessories may be incorporated to provide automatic time and labor-saving features.

THE COMPLETE LINE OF Century MOTORS

Includes a wide range of types and kinds from 1/6 to 400 horsepower —single phase, polyphase and direct current.



Rear view illustrates control equipment and drive motor on top of machine.

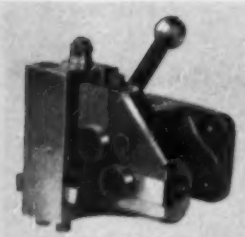


The top two small dials provide an extremely wide range of optimum surface cutting speeds. A twist of the finger instantly changes the speed.

Specify Century MOTORS ON YOUR EQUIPMENT—OR CALL THE CENTURY OFFICE LOCATED NEAR YOU.

CENTURY ELECTRIC COMPANY

1806 Pine St. • St. Louis 3, Missouri • Offices and Stock Points in Principal Cities.



THE SINGLE CUTTER TURNER mounts the cutter tangentially behind the work. Thus the chips never clog the tool but fall free into the pan, and the operator is shielded from splashing coolant. The rigidity and the quick, accurate micrometer adjustment makes this tool highly efficient for rapid production.

THE CENTER DRILLING TOOL is extremely sensitive and fast in operation. Interchangeable collets adapt the several sizes of center drills.

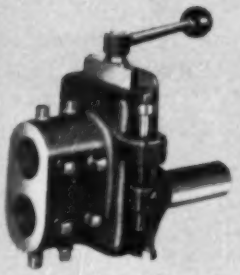
THE OVERHEAD PILOTED SLIDE TOOL combines versatility with new rigidity and accuracy, and is a real time saver on boring, facing and recessing operations.

THE ADJUSTABLE TURNING HEAD carries cutter holders and boring bars. The large diameter graduated micrometer dial facilitates the quick and accurate setting of the cutter.

THE BALL BEARING CENTER rigidly supports the work at high speed for roughing cuts from the cross slide.

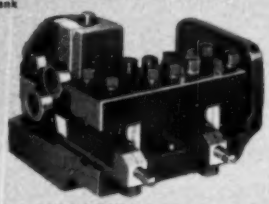
THE RELEASING TAP HOLDER provides positive drive, sensitive release and sufficient float for the alignment of the tap. A spring collet, with square shank for driving, holds the tap.

THE ADJUSTABLE CUTTER HOLDER permits quick micrometer adjustment for turning to close tolerances.



THE QUICK-ACTING SLIDE TOOL is outstanding for operations such as back facing, internal necking and recessing.

THE PILOTED MULTIPLE TURNING HEAD features a pilot bar mounted on the headstock, leaving the hexagon turret unencumbered of its added weight and bulk. A large series of cutter holders and boring bars can be adapted for multiple turning, boring and facing.



THE MULTIPLE CUTTER TURNER has the roller back rest interlocked with the tool cap for increased rigidity. An additional roller back rest can be supplied as an extra.

Efficient Tools on your Turret Lathe

MEAN HIGHER PRODUCTION AND LOWER COST...

THE TOOLS SHOWN constitute only a few of the hundreds of different kinds and sizes of turret lathe tools that we build. Bardons & Oliver tools are outstanding in design and efficiency of metal removal, in ease of accurate size adjustments, and high quality of finish produced.

While these tools are designed primarily for use on the Bardons & Oliver ram and saddle type turret lathes, many of them can be applied to render other makes of turret lathes capable of increased production.

The latest cemented carbide cutters can be used to their full productive capacity in Bardons & Oliver tools.

These two tool catalogs will help you to select the proper tools for your turret lathes. Your copies will be mailed promptly, upon request.

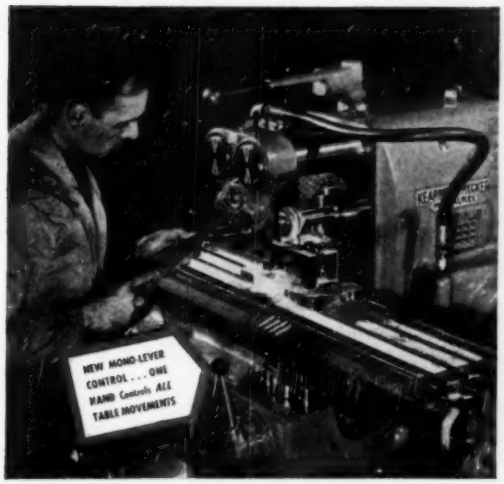
We build a complete line of ram and saddle type turret lathes, also automatic and hand operated cut-off machines.

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

Looking for savings?

PRODUCTION JUMPS 43% HANDLING THESE SMALL PARTS



Here's a picture of savings in the making. Operator sets up machine for automatic cycle operation and engages the Mono-Lever Control just once for each cutting cycle. Result: a 43% production gain on this small parts milling job.

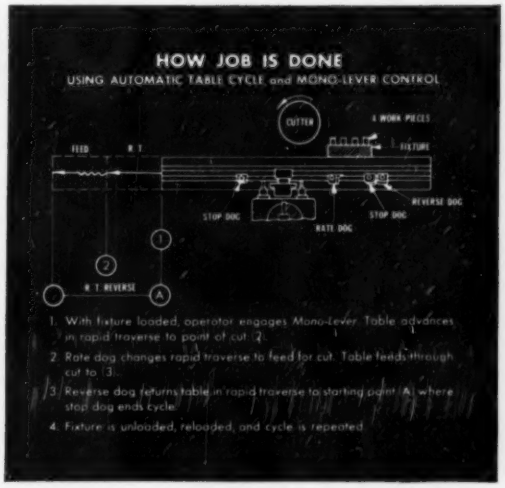

HOW JOB IS DONE
USING AUTOMATIC TABLE CYCLE and MONO-LEVER CONTROL
CUTTER
4 WORK PIECES
FIXTURE
FEED
R. T.
REVERSE DOG
STOP DOG
RATE DOG
STOP DOG
R. T. REVERSE
1. With fixture loaded, operator engages Mono-Lever. Table advances in rapid traverse to point of cut (2).
2. Rate dog changes rapid traverse to feed for cut. Table feeds through cut to (3).
3. Reverse dog returns table in rapid traverse to starting point (A) where stop dog ends cycle.
4. Fixture is unloaded, reloaded, and cycle is repeated.

Diagram shows how machine mills four workpieces at a time without constant operator attention. Automatic cycle eliminates need for hand "inching" operation to cut. Operator easily inspects and burrs finished pieces while machine is running.

COMPARE

Production by old method.

Production gain using a Kearney & Trecker Milling Machine with Mono-Lever Control and Automatic Table Cycle.

HERE'S GRAPHIC PROOF OF SAVINGS RESULTS

1. The minimum over-all savings reported from any job when done on a Kearney & Trecker Milling Machine with Mono-Lever Control and Automatic Table Cycle.
2. The *majority* of over-all savings from jobs done on these machines fall here.
3. Under favorable conditions, several jobs done on these machines have shown savings like this!

How are your milling costs? The typical job data given here plus the bar graph, at left, shows you what other users of new Kearney and Trecker Milling Machines with Mono-Lever Control and Automatic Cycle have done to reduce their milling costs. It also shows what these machines can do to reduce yours — from *16%* to *96% on most milling operations!*

Contact us or our nearest representative today. Get proven facts on how Kearney & Trecker Milling Machines with Mono-Lever Control can cut your costs — increase your savings. No obligation. Kearney & Trecker Corporation 6784 West National Avenue, Milwaukee 14, Wisconsin.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Buy One

MOTOR STARTERS with the 'Strongbox' Magnet Coil

All the best features in popular sizes for motors to 50 hp. See for yourself. Get a new General Electric Motor Starter. Get out your screwdriver. And get the facts. Make your own comparison on these big ALL-NEW features:

STRONGBOX MAGNET COIL — Coil is locked in a tough block of plastic.

NEW ARC HOOD — Molded, burn-resistant arc hood snuffs arc immediately.

NEW CONTACTS — Large silver contacts with plenty of contact pressure give long life. Convertible from normally open to normally closed in size one and smaller — without additional parts.

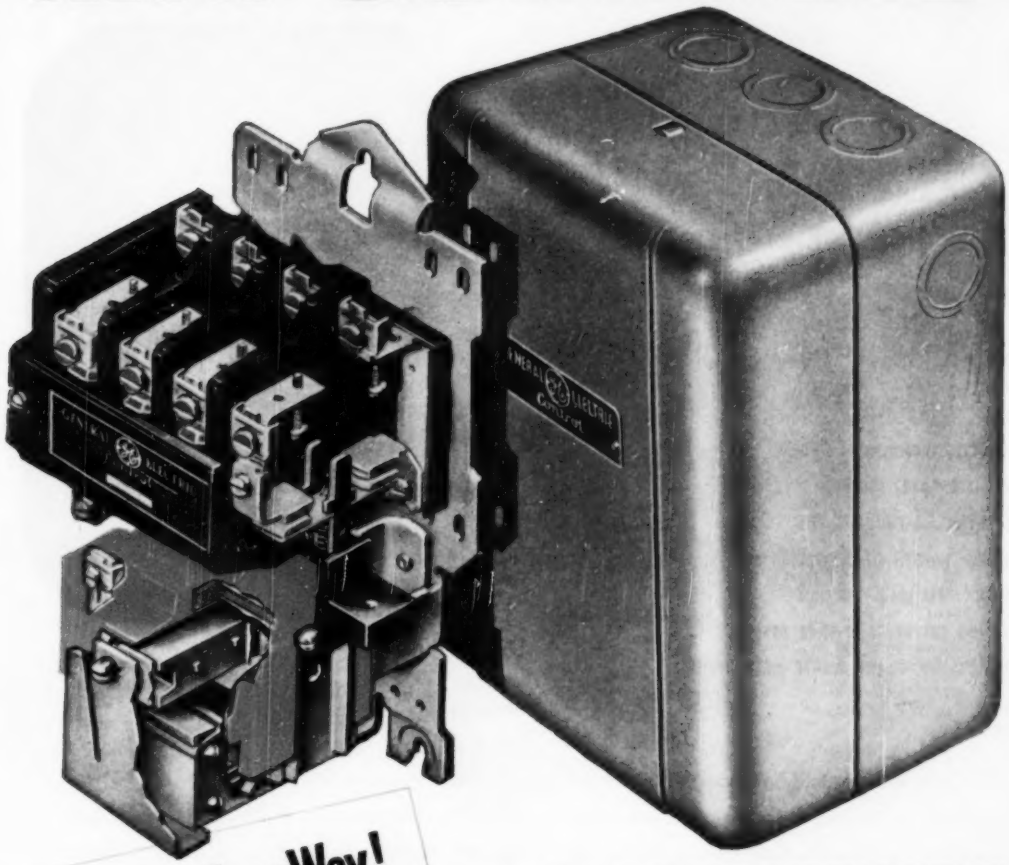
NEW MAGNET — Quick direct action, large striking surface.

EASY TO INSTALL — EASY TO MAINTAIN — See how easy it is to get at the ALL-NEW General Electric starter. Note, too, that it's built to take the punishment of day-in, day-out use with a minimum of maintenance. Check the wiring space inside the case. Check the terminal clamps that make installation fast. Check the ease with which controls can be inspected.

DESIGNED FOR FAST ACTION — BUILT FOR LONG LIFE — From the tough STRONGBOX magnet coil to the high strength arc hood, all parts of the new General Electric Motor Starter are built to last. In the revolutionary G-E design, the plastic coil enclosure also serves to guide the armature. For fast, positive action the tough plastic block is impregnated with a permanent lubricant — molybdenum sulphide. Channel-reinforced magnet guides slide smoothly for quick action at all times. Bimetallic thermal relays give swift protection.

GENERAL ELECTRIC

and COMPARE



Order this Easy Way!

Look inside. Make the screwdriver comparison test. Inspect the many new features, and we're sure you'll be enthusiastic. Just fill in the coupon at the right and we'll send you the starter immediately. Or, if you prefer, we'll be glad to send you the new, free, tell-all booklet "Look Inside and Compare" that gives more detailed information.

General Electric Company, Apparatus Department
Section L676-281, Schenectady 5, N. Y.

Send me one of the NEW CR7006 starters (size 1, 3 pole, enclosed). List Price $22.00.

_____ Check Enclosed. (Add any state or local sales or use taxes)

_____ Purchase order attached; bill to our account with: _____

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(Name and address G-E sales office or G-E distributor.)

Motor Horsepower Rating (check one)

☐ 3 ☐ 5 Horsepower at 220 Volts
☐ 3 ☐ 5 ☐ 7½ Horsepower at 440 Volts } 60 Cycles, 3 Phase

Approx. Motor Speed ☐ 1800 RPM ☐ 3600 RPM ☐ 1200 RPM

Name _____

Address _____

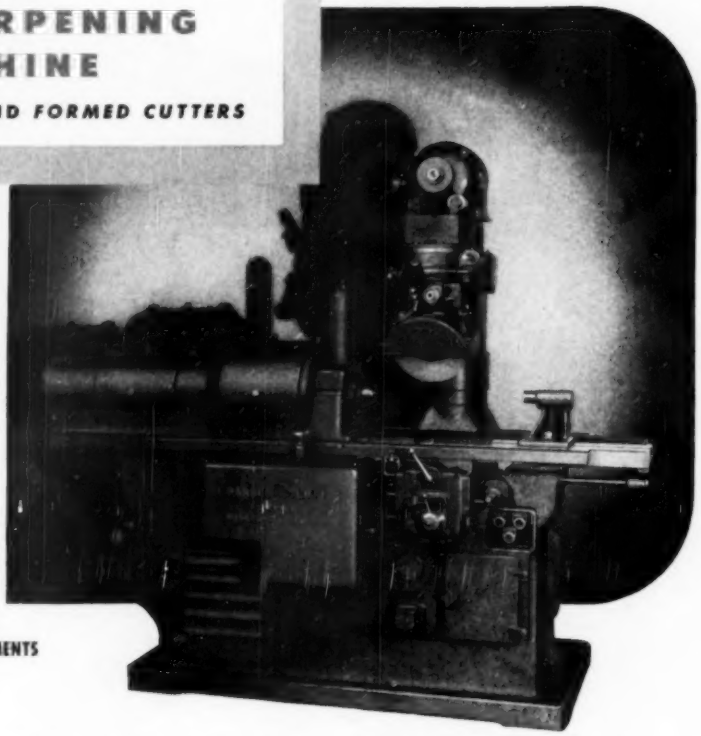
City _____ **Zone** _____ **State** _____

THE BARBER-COLMAN No. 10-12

Automatic
HOB SHARPENING MACHINE

FOR *HOBS AND FORMED CUTTERS*

SEE THESE POSITIVE SHARPENING CONTROL FEATURES



AUTOMATIC MECHANICAL INDEX
HYDRAULIC TABLE STROKE
AUTOMATIC MECHANICAL FEED
VARIABLE LENGTH OF STROKE
TANGENT BAR LEAD CONTROL
PRECISION SETTING FOR FACE OFFSET
PRECISION DEPTH AND ANGLE ADJUSTMENTS

This machine is built for accuracy. Simple machine adjustments permit easy, quick set-up and place precision face sharpening of hobs and form cutters within the range of any operator. Heavy duty design and automatic operation provide precision mechanical control over all sharpening elements.

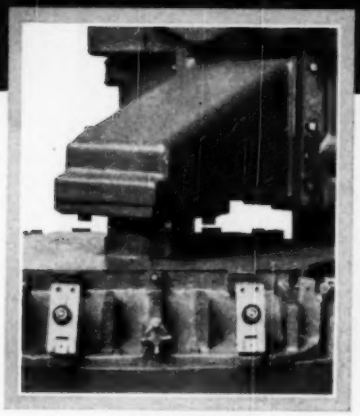
Get the complete story of the No. 10-12 Automatic Hob Sharpening Machine. See how it handles straight or helical work, large coarse pitch hobs, tapers, right or left shank tools and high helix angles. Ask for Bulletin 6114.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 0114 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

BARBER COLMAN

NEWTON VERTICAL SPINDLE ROTARY CONTINUOUS MILLING MACHINES



CENTER SUPPORT
Furnished when required

DESIGNED FOR HEAVY MILLING WITH CARBIDE CUTTERS

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

This representative example of Newton high production milling machines has the advanced features required for heavy precision milling with carbide cutters and motors up to 50 H.P. An unusually rugged frame provides the rigidity necessary to such operation. On long work pieces such as automobile and tractor cylinder heads, 36" between spindles makes possible the completion of the roughing cut before the finishing cut starts. Independent pick-off gears for each spindle provide the means for correct cutting speeds for both roughing and finishing cuts. Heavy flywheels, solidly attached to each spindle, insure maximum cutter life between grinds. Intermittent feed—rapid traverse attachment and center support are optional. Two standard table sizes. Other table sizes and spindle center distances are available. Newton Milling Machines, applicable to your precision milling problems, will help to step up your production and reduce your costs. Complete information will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

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CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

A "Multi-Dividend" Investment
for production milling of small parts

THIS modern, manufacturing-type milling machine is a glutton for work. It is highly efficient and adaptable to all types of small milling operations. It produces work of consistently-uniform accuracy and finish and operates at an extremely rapid, economical rate. In nearly every plant there are plenty of jobs to keep the Brown & Sharpe No. 000 busy . . . continuously . . . assuring multi-dividends from the investment, over a long period of time.

Get the advantages of low-cost, high quality milling on small pieces such as parts for sewing machines, radios, industrial instruments, business machines and similar products. Collect "multi-dividends" on your investment in milling equipment. Send for the No. 000 illustrated Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

THE VERSATILE No. 000 PLAIN MILLING MACHINE

No. 000 DIVIDEND FEATURES

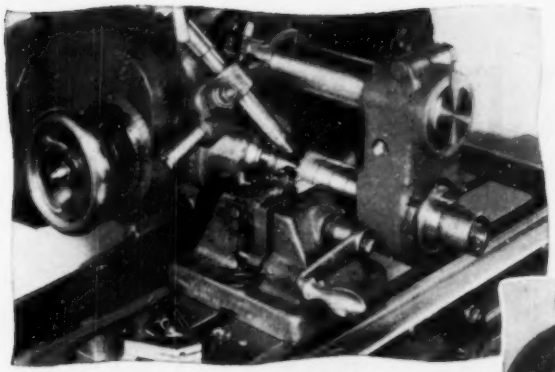
for consistent accuracy and finish

- 16 changes of spindle speed, 105 to 3540 R.P.M., suitable for milling a wide range of materials—extra high speed range available.
- 16 rates of feed from 9/16" to 24⅜" per minute—with full automatic operation.
- Direction of spindle rotation can be set by switch. With intermittent operation, spindle stops when table stops . . . to assure safety in loading.
- Table reversal accurate to .002" . . . particularly advantageous in making blind cuts.

for fast production rate

- Extremely rapid fast-travel movement.
- Work can be safely advanced at fast travel close to cutter.
- Wide range of feeds permits fast efficient milling on a variety of materials.
- Automatic cycle reduces operator fatigue and non-cutting time to minimum — often permits operator to load work with both hands.
- Simple, fast set-ups.

BROWN &

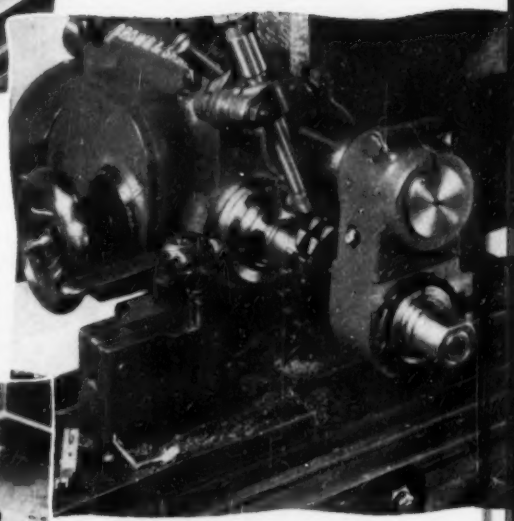


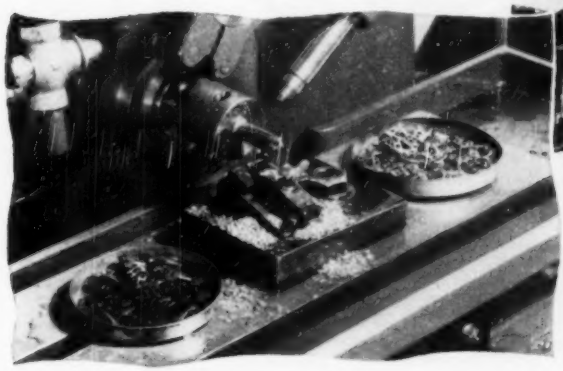
A Dividend of Accuracy ▲

Consistent accuracy of table reversal . . . to .002" . . . assures uniform depth of slot in this blind cut.

A Dividend of Speed ▼

Rapidity of table movement permits taking light, short cuts practically as fast as operator can load and unload fixture.



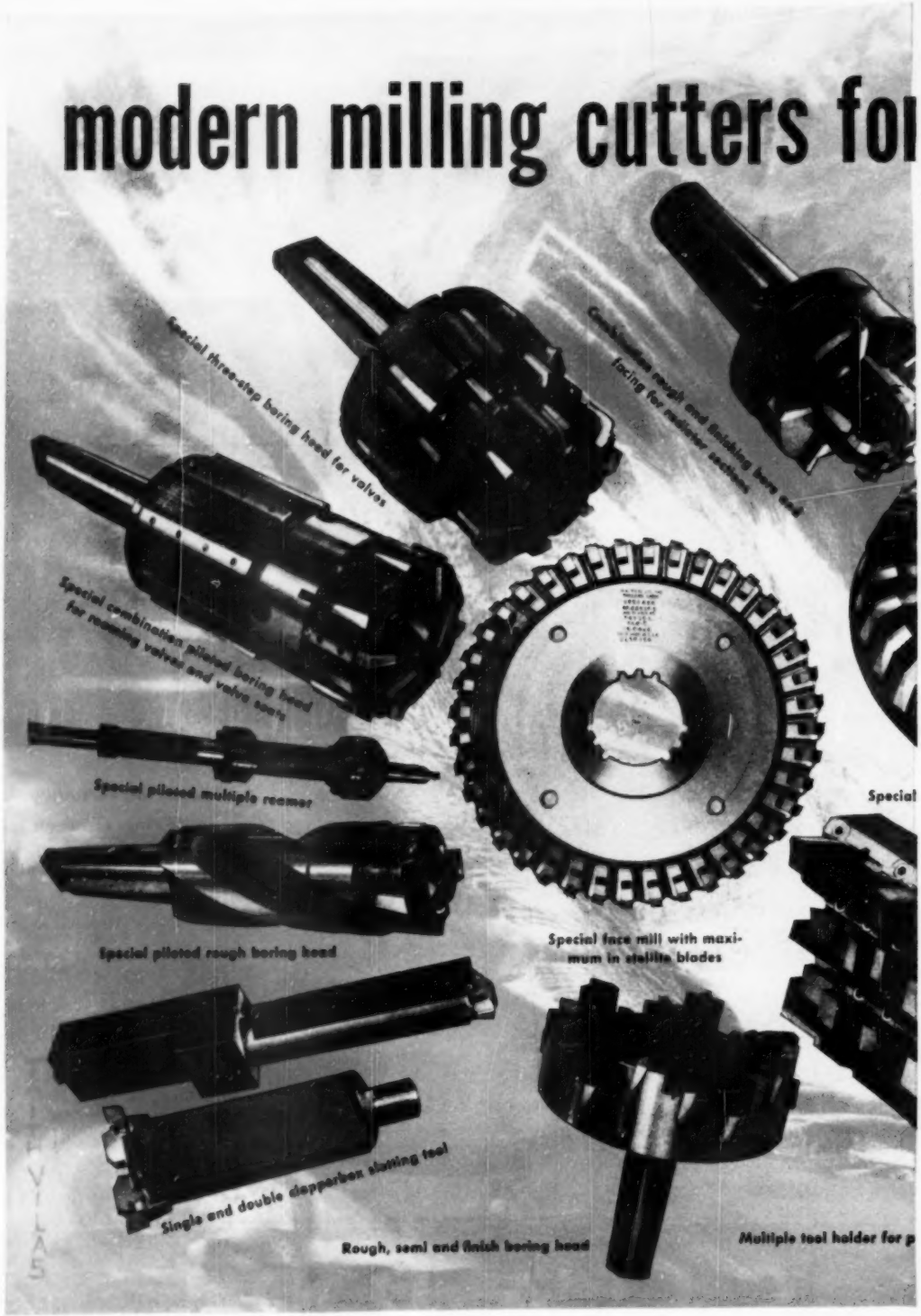


A Dividend of Versatility ▲

Broad range of spindle speeds permits efficient use of comparatively large cutters down to the smallest end mills.

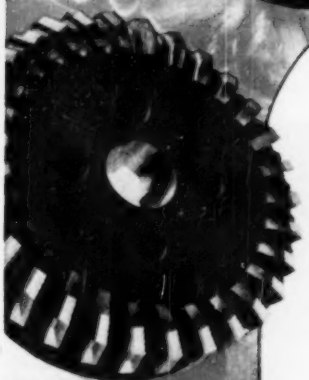
SHARPE

B·S


modern milling cutters for
Special three-step boring head for valves
Special combination pilot boring head for reaming valves and valve seats
Special pilot multiple reamer
Special pilot rough boring head
Special face mill with maximum in stellite blades
Special
Single and double dapperbox slotting tool
Rough, semi and finish boring head
Multiple tool holder for p

r modern milling machines

Combination hollow mill and facing head



carbide-tip finishing face mill

planing planer ways

OK

multiple operation TOOLS

Built with more beef in the body to better meet tomorrow's tougher steels, higher speeds and faster feeds • Combination tools for boring, facing and chamfering with one pass • Dual adjustable milling cutters with inserted blades of sintered carbide, cast alloys and high speed steels • Ganged cutters for more production and lower costs per man, per machine • All cutters have the famous OK blades, tapered and serrated for easy insertion, removal and adjustment to compensate for wear.

BOOTH 221

TOOL ENGINEERS SHOW, PHILADELPHIA

Mark as a must a visit to our booth to learn the latest advancements in the art of metal cutting

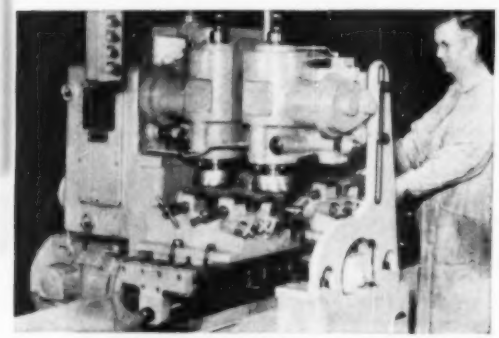
THE OK TOOL COMPANY

Division, Williams and Hussey Machine Company, Inc.

WILTON, NEW HAMPSHIRE

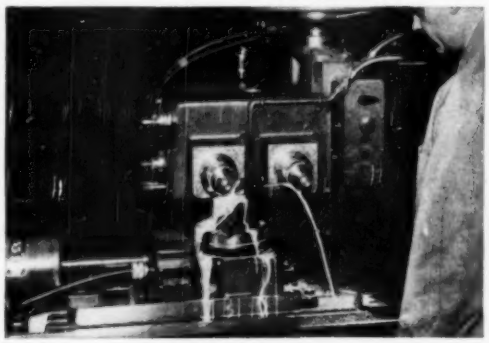
Here's what can be done with Standard Rigidmils.. TO SOLVE SPECIAL MILLING PROBLEMS!

On standard Sundstrand Rigidmils, the head is a self-contained unit which can easily be replaced with a special head. Consequently, when production or work requirements permit machining several surfaces simultaneously, the standard head can be replaced with a special head, and a *special* job done with the lowest possible capital investment. Furthermore, putting into effect product changes (a difficult problem for many production engineers) doesn't worry anybody in plants where Rigidmils are installed. As these machines can be converted so readily to meet product changes, they represent a combination of maximum production with minimum capital investment. Here are six good examples of standard Rigidmils "engineered" to a production job with "only the head as special."



Standard Rigidmil With Two Special Vertical Heads Mounted On Cross Rail

Two top pads on thin, cast iron sewing machine bases are milled simultaneously. The table holds two fixtures, one at each end. Operator loads at one end while part is being milled at opposite end. Thus, loading time is free and production increased. Each spindle mills one pad on part, and heads are adjustable on cross rail to facilitate handling a number of different sizes of parts—a good example of special milling production using a standard Rigidmil with only the head being special.

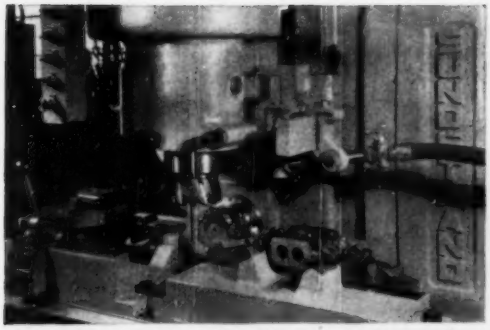


Standard Rigidmil With Special Two-Spindle Horizontal Head

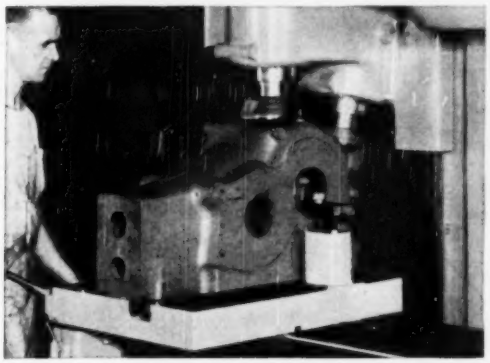
This machine form-mills the teeth in steel clutch drive shafts. Each tooth has a radial undercut on both sides so that the teeth cannot be straddle milled with one cut. For this reason, the standard head was replaced with a special two-spindle head. With an automatic index base centrally located on the table between the spindles, one side of the tooth is formed with the R.H. cutter and the opposite side with the L.H. cutter. After loading the part the operator merely pushes the start button. The machine then automatically forms the teeth by alternate cutting and indexing between the two cutters.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

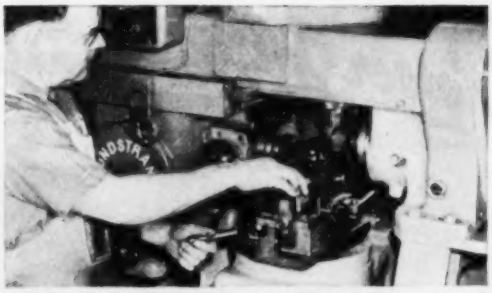


Standard Rigidmil With Regular Horizontal Spindle and Special Vertical Spindle Each spindle carries one carbide tipped cutter. Two fixtures are mounted on the machine table. In L.H. fixture, 2 right angle surfaces of a cast iron manifold are machined, one by horizontal spindle and one by the vertical spindle. Part is then transposed to the R.H. fixture (locating from previously milled surfaces) and a 3rd surafce is machined with the horizontal spindle. Table cycle is automatic so operator can load at one fixture while part is being milled in opposite fixture.

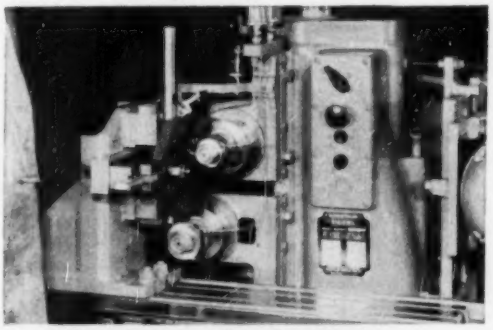


Standard Rigidmil Has Special Head With Vertical and Angular Spindles The special angular spindle permits the milling of an angular pad simultaneously with a flat pad on top of tractor frames. These frames, held in a simple, quick-clamping fixture, are milled at the rate of 32 per hour.

Free Data Write for more proof of the successful application of Sundstrand "Engineered" milling production. This new 40 page book contains over 35 actual problem solutions together with interesting tooling diagrams. Write for your copy today. Ask for Bulletin No. 194.



Standard Rigidmil With Special 3 Spindle Head Three sides of a compressor part are milled on this Rigidmil. Machine also has automatic index fixture so that a part can be loaded in one station while another part is being milled in the 2nd station. Loading time is free and a production of approximately 172 pieces per hour is obtained. Three surfaces are held accurately in relation to each other.



Standard Rigidmil With a Special Two Spindle Horizontal Head The two horizontal spindles are offset so that while the lower spindle feeds through the diameter of the shaft the upper spindle mills through the O.D. of the shaft, to form the slot in a steel center drive tubing for a washing machine. A simple, manually operated work-holding fixture holds one piece at a time, and an automatic table cycle of rapid approach, feed and rapid return is used to complete 74 pieces per hour.

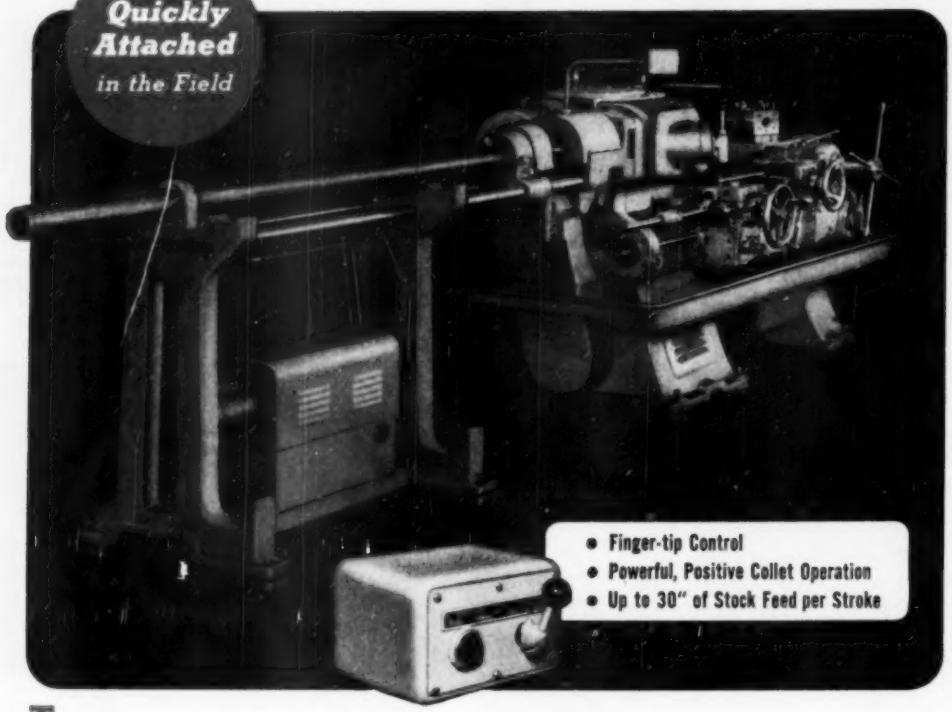
SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

Power Operated BAR FEED AND COLLET CHUCK

. . . cuts turning costs

***Quickly Attached** in the Field*



This new, work-saving development is a rigid, heavy-duty hydraulic unit built to handle full capacity bars at full capacity spindle speeds.

It provides effortless finger-tip control of bar feeding and chucking, enabling operators to *maintain a faster, steadier pace throughout the day.*

It can be attached quickly to ANY J & L No. 3, 4, 5, 7A and 8A Universal Turret Lathe in the field.

★ Handles ● ■ or ⬢ stock
★ Side-loading, silent safety tube
★ Heavy, wide support legs
★ Levelling and floor lagging screws
★ Wide-spaced steel guide bars
★ Feed chuck mounted on anti-friction bearings
★ Independent hydraulic unit
★ Automatic strip-back cycle
★ Auxiliary feed chuck available

Turret Lathe Division **JONES & LAMSON** MACHINE COMPANY
Springfield, Vermont, U.S.A.

Write to Dept. 710 for Complete Information

MACHINE TOOL CRAFTSMEN SINCE 1835

See THE SIP JIG BORING and MILLING MACHINE in action at BOOTH No. 502 ASTE SHOW

ACORDIAL invitation is extended to all visitors at the ASTE show to see first hand the very last word in Swiss Jig Boring and Milling Machines—the HYDROPTIC-7.

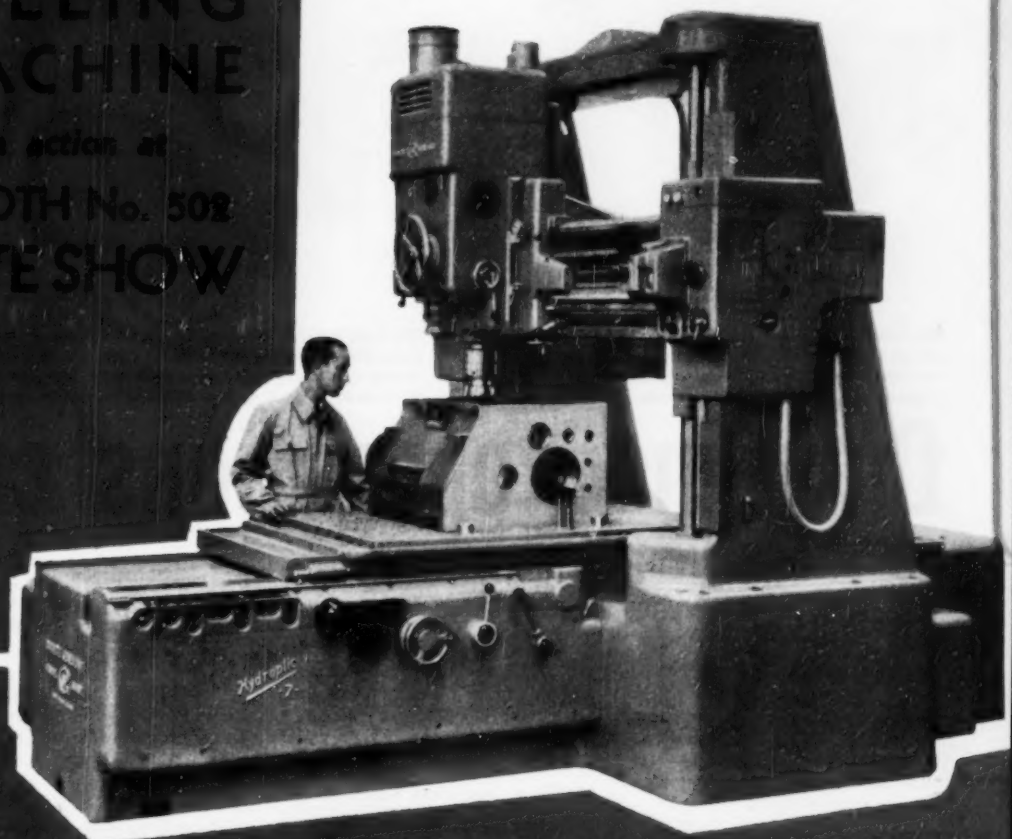
The versatility of this world-famous Swiss machine, its convenience and uncompromising precision are universally-known characteristics of the entire line of SIP machines.

New attachments, developed by SIP, which extend the utility of these machines, will also be shown, as well as the handling of jobs to dimensional limits far beyond those ordinarily considered attainable.

Be sure and ask our demonstrators to put the HYDROPTIC-7 through its paces . . . on jig boring. See it in production on milling operations. Feel free to ask questions as to how a SIP Jig Boring and Milling Machine can play highly important roles in your plant.

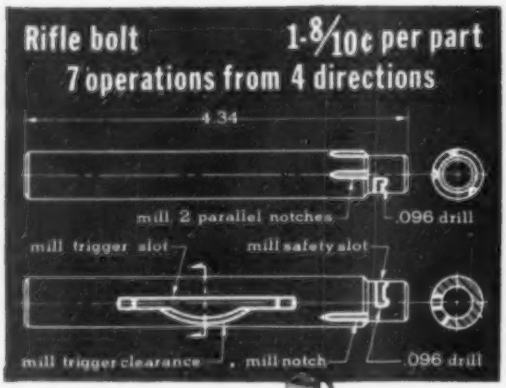
Spend as much time as possible at the SIP Exhibit—booth No. 502. We're certain you'll gather a lot of information that will be valuable when you get back home.

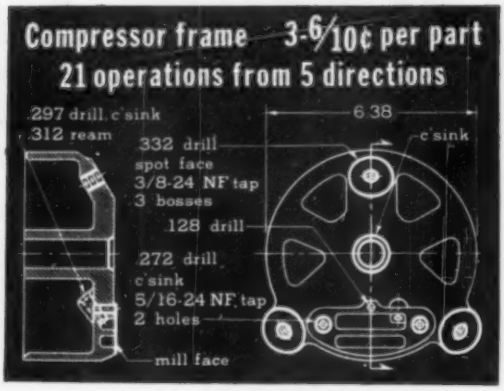
To those unable to attend the ASTE Show, we suggest your sending for the latest literature on the SIP line.

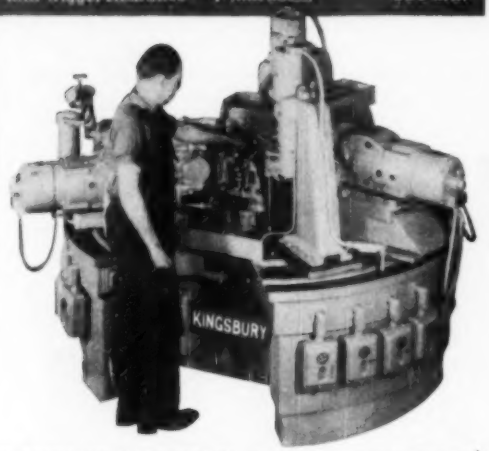


AMERICAN SIP CORPORATION

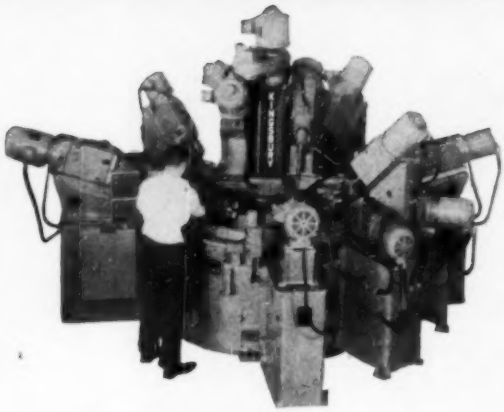
100 East 42nd Street New York 17, N. Y.







295 PARTS AN HOUR GROSS. A 20-inch power index table has seven fixtures. Two horizontal units off the radial lines drill the holes. Three radial horizontal units mill the slots and trigger clearance. Two vertical units mill the three notches.



390 PARTS AN HOUR GROSS. A 60-inch power index table has eight fixtures. At three stations nine units operate on three bosses. At four stations nine tools work from the front and units on the central column do the angular hole from the rear.

Combined operations cut

Single-purpose drilling and tapping machines, built to each customer's needs, produce much more per man-hour

Dear Sir:

General-purpose machines can do the operations above. But these Kingsburys do them much cheaper and much faster. A Kingsbury does thousands of operations each hour — all automatically. One operator loads and unloads the parts.

Units perform the operations

A suitable drilling or tapping unit does each operation. If necessary we add a milling attachment or multi-spindle auxiliary head. Each unit is automatic and has its own motor (1/3 to 5 hp). Units can be horizontal, vertical or at angles. (By the way, all 16 units for the compressor frame are at angles.) In one chucking of a part, a Kingsbury can do a variety of operations from many directions.

Uniform, accurate machining

Machining is uniform. Each unit has an automatic cycle and cam feed that do not vary. All fixtures on any one machine are interchangeable. Each machine does many operations on the part while it stays in its fixture and no one touches it.

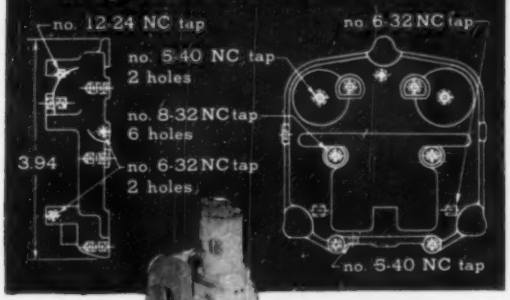
Tools work to close tolerances. Bushings guide drills and reamers. The bushings are in the fixtures or in plates that pilot to the fixtures.

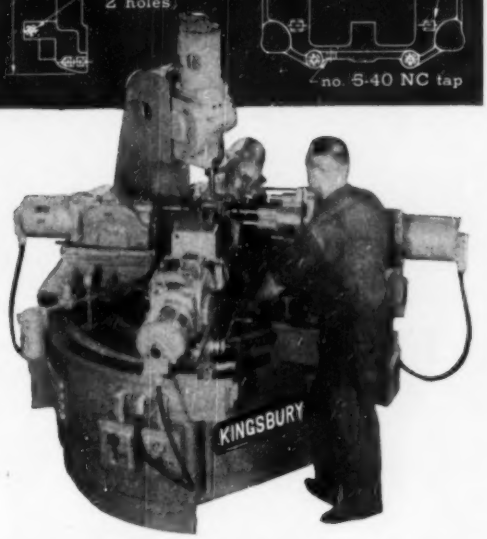
You are the boss

You name the output rate and the operations and approve the sequence. You approve our fixture design before we start engineering. You approve samples before we ship the machine.

Our key men take a real interest in your machine. They know it by name. If someone mentions an order number they ask, "Whose machine is that?" They attend to your requests on safety features, electrical equipment, tool holders, guide bushings, paint, etc. Even the president and vice-president

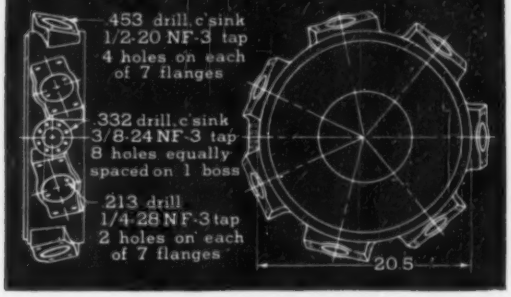
Meter frame **1.0¢ per part**
13 operations from 5 directions

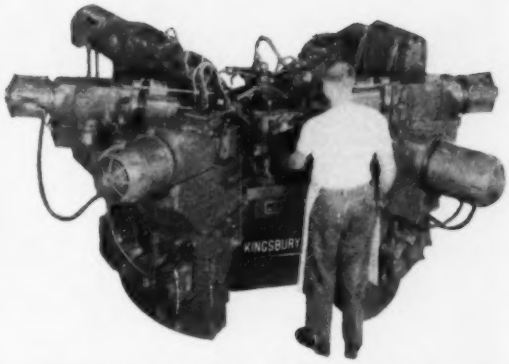




360 PARTS AN HOUR GROSS. One vertical and four horizontal units tap five sides of the same part at the same time. There is no indexing. Three units have multi-spindle auxiliary heads. Two Kingsburys ahead of this setup drill these and other holes.

Airplane engine part **32¢ per part**
136 operations from 8 directions





21 PARTS AN HOUR GROSS. One part at a time indexes on its axis, 1/7 turn per index. Three angular units drill the flanges after indexes 1 to 7, countersink after 2 to 8 and tap after 3 to 9. Three horizontal units do the eight holes after indexes 1 to 3.

cost and increase output

spend most of their time on proposals and machines for our customers.

The crucial moment

Your Kingsbury arrives. (Ten to one it's on time.) You remove the skids and rust-proofing, level it, connect the power and air lines, run off samples and inspect them. You call the front office. "That new Kingsbury is in production. Do you want to see it?" It is as simple as that.

That is one reason why plants keep on buying Kingsburys. Since the last war ten plants have paid us $4,072,690 for new equipment, none of these ten under $200,000. (Don't let this scare you. Some plants may require only *one* Kingsbury.)

Can we save you money?

It costs nothing but a little time and a stamp to get a firm proposal. Just send a print to our Mr. L. A. Carll. Tell him the operations and hourly output you need. Or ask him for free bulletins showing 53 setups.

Sincerely,
Kingsbury Machine Tool Corp.
120 Laurel Street, Keene, N. H.

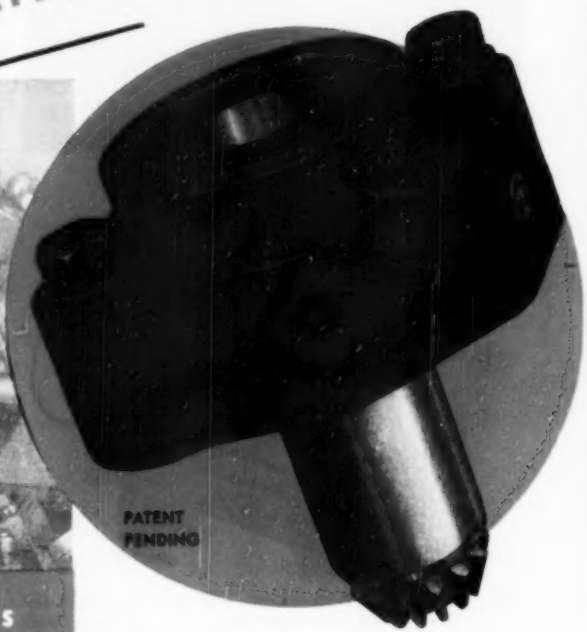
About the costs on the drawings

Each unit cost includes the man and machine on all operations shown – no power or overhead. We assumed three things: 1) 80% efficiency, 2) Each man's wage rate would equal the national average for such work, 3) The entire cost of each machine and tooling would be paid for after only 6000 hours of operation, a fraction of its useful life.

KINGSBURY

AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

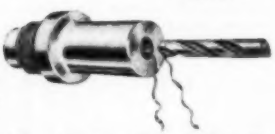
ANOTHER NEW BOYAR-SCHULTZ TOOL FOR AUTOMATICS to... Speed



Check These Advantages of the New Deep Hole Drilling Tool

- ✔ 1. Speeds up drilling.
- ✔ 2. Permits increased feeds.
- ✔ 3. No pullouts. Drills straight through—7 to 10 diameters in free machining, tool, and stainless steels. 10 to 12 diameters in brass and aluminum.
- ✔ 4. Longer drill life. No burned up drills.
- ✔ 5. Improves concentricity.
- ✔ 6. Uniformity in size and finish of hole.
- ✔ 7. Adjustable to compensate for misalignment between turret and spindle.

A



without using Boyar Schultz Deep Hole Drilling Tool

B

When using Boyar Schultz Deep Hole Drilling Tool

Material 5/16" diameter SAE #1112

BOYAR-

WALNUT STREET, CHICAGO 12, ILL.

..up.. PRECISION DEEP HOLE DRILLING

When it is necessary to drill a hole deeper than four times the diameter of the drill, in the past it has been withdrawn from the hole one, or more times in order to remove the long, stringy chips which it cuts. This standard procedure to reduce friction and maintain concentricity—in short, to make the job run, is now eliminated. The new Boyar-Schultz Deep Hole Drilling Tool, by employing a special oscillating action to the drill holder head, breaks up the chip into small particles, dissipating it along the flutes of the drill, making pullouts unnecessary.

The value of this new tool is immediately apparent. Time spent on drilling a deep hole is appreciably shortened by eliminating pullouts. Drill life is longer because heat caused by friction of chips against drill is lessened. Less grinds per drill means less down time, more parts per hour, and less broken drills.

Concentricity, long a problem in deep hole drilling, is improved because the chip with this tool is now broken and no longer interferes with the free operation of the drill. Improved concentricity means more accurate parts, fewer rejections, satisfied customers.

Increased feeds and surface feet may be gained when tool is set up properly. This gain speeds up the time cycle of the job. Hole size accurately maintained saves down time through doing away with the need for constant regrinding of drill. Like other new Boyar-Schultz tools, the Deep Hole Drilling Tool is adjustable to compensate for possible misalignment between turret and spindle.

Free machining, stainless, and commercial tool steel parts may be drilled without pullouts to approximately 7 to 10 times the diameter of the drill. Brass and aluminum parts are drilled up to 10 and 12 times the diameter of the drill, without pullouts. More specific information regarding size of drills in relation to depths of holes may be obtained from us.

The Boyar-Schultz Deep Hole Drilling Tool is made in three sizes—#00, #0 and #2 on single spindle automatics. It also may be adapted for use on multiple spindle machines. On the former, it is motivated by the gear at the back of the shank being meshed with the standard revolving drill attachment stand. A direct drive system may also be devised, employing a flexible shaft setup. Additional information on this arrangement is available.

Actual tests prove our statements! When tool is set up and operated properly, results such as illustrated here can be obtained.

The piece, as shown in A required 16¼ seconds to drill with a solid type drill holder, using four pull-outs. Due to sequence of operations, the turret was filled with other tools, leaving space for only one drill. Long, stringy chips caused a concentricity problem.

With the Boyar-Schultz Deep Hole Drilling Tool, shown in B, the hole, with a depth of 8 times the diameter of the drill, was completed in 6-1/5 seconds without pullouts. The hole was to size and concentric to within .002" to the outside formed diameter. In addition, the chips, broken as illustrated, cannot curl around the work to interfere with its forming or other turret operations.

This same set-up will be demonstrated on a machine in our booth No. 133 at The ASTE Cost Cutting Exhibition, Philadelphia, April 10-14.

SCHULTZ CORPORATION

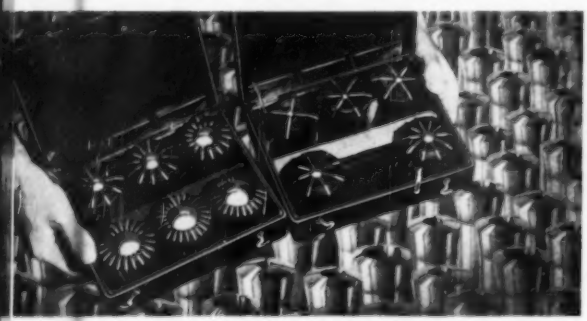
NEW COLLET CHUCK'S GREAT GRIP IMPROVES PERFORMANCE ON YOUR LATHE

Developing the tightest, most accurate grip ever devised in lathe collet equipment, Jacobs' new Spindle Nose Lathe Chuck delivers from two to four times more torque than split steel collet chucks.

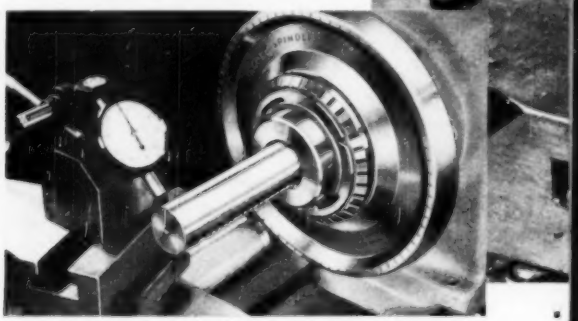
Work cannot slip under the heaviest cuts of the most modern tool room lathes. Despite this ruggedness, the unique design of the collets allows the softest, most fragile materials to be chucked without marring or scratching.

A big order? Certainly . . . but it's filled perfectly by this remarkable new chuck with its unique Rubber-Flex Collet. Multiple alloy steel jaws, hardened and ground, are bonded and mechanically locked together by Hycar synthetic rubber which will not set and is unaffected by heat, coolants or cutting oils. The collet's extra long steel jaws are always parallel to the work and the gripping load is thus distributed over the entire bearing surface. Result: accuracy and gripping power never before obtained in lathe collet chucks.

See your Jacobs distributor for bulletin 49-LC describing this new Lathe Collet Chuck.

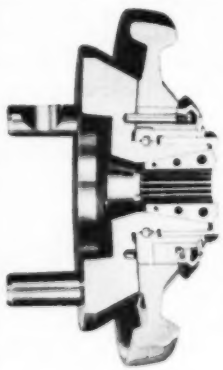


SO FEW DO SO MUCH . . . Each Jacobs Rubber-Flex Collet has a capacity of 1/8". Its grip is constant throughout this range. Only eleven collets are needed to chuck any bar from 1/16" to 1 3/8" diameter . . . contrasted with the 88 split steel collets needed to equal this chucking capacity by 1/64ths!



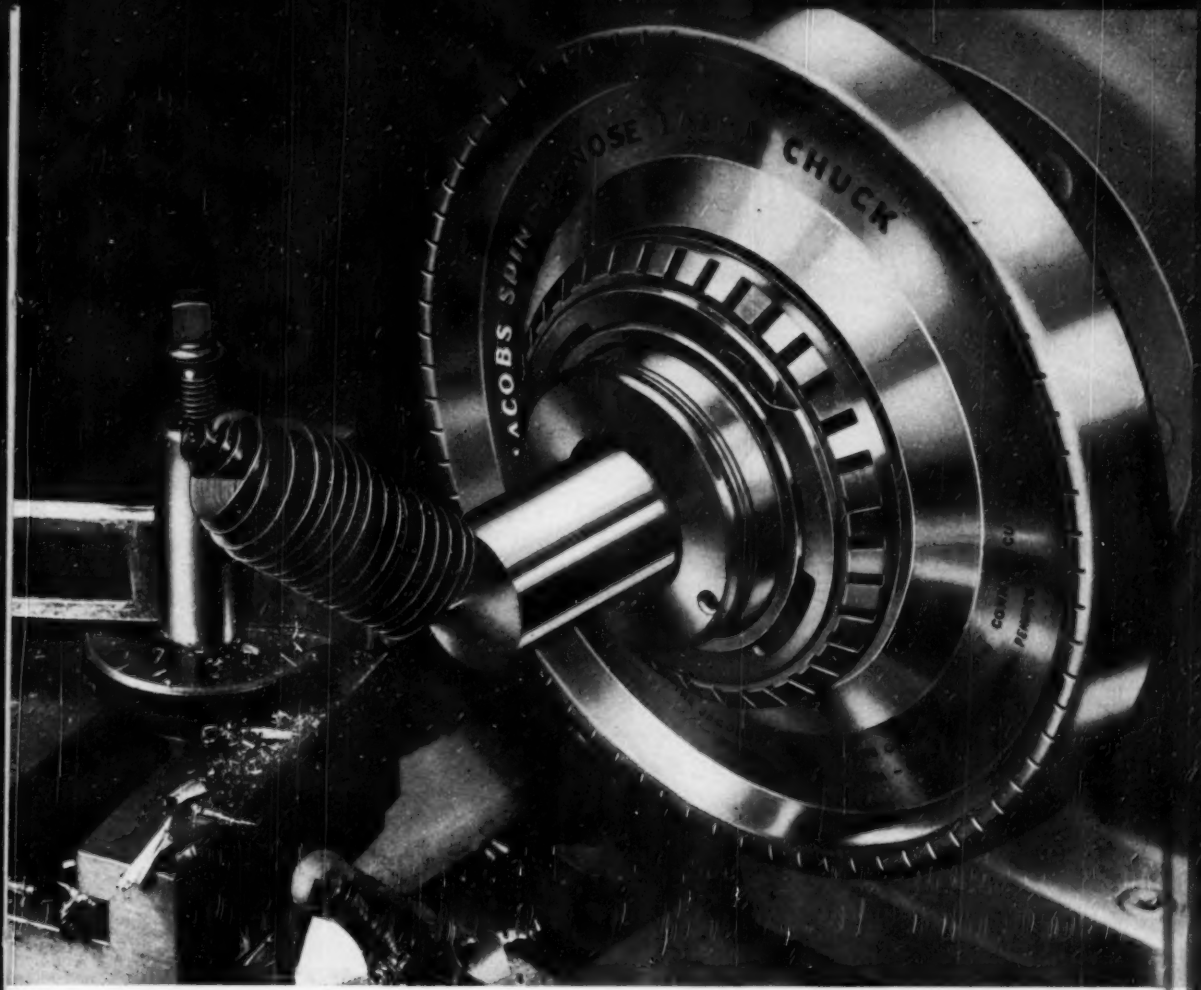
UNMATCHED ACCURACY . . . This chuck is designed to allow an unusual control of runout — it is the most accurate lathe collet chuck in the world today. The body is made from a single alloy steel forging. All bearing surfaces of the chuck and collets are of alloy steel, hardened and ground.

UNIFORM GRIPPING PRESSURE . . . permits the chuck to hold thin-walled tubes, plastics, wood and other fragile materials with no danger of marring or scoring. Grip is so evenly applied around circumference of work, no denting is possible.

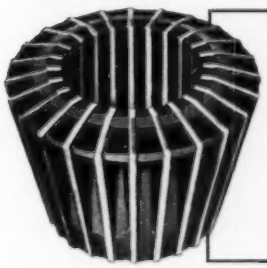


RUGGED CONSTRUCTION

All parts except solid aluminum hand-wheel are of hardened and ground alloy steel. Compact design saves 1½" of overhang compared with other chucks. Impact tightening mechanism opens and closes chuck with great ease.

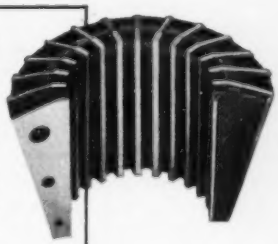


MAXIMUM FEEDS AND SPEEDS . . . Pictured above is a 1⅜" cold rolled bar being removed in a single pass with a feed of .008". Only the tremendous gripping power of the Rubber-Flex Collets permits this remarkable feat.



THE JACOBS RUBBER-FLEX COLLET

1. All external and internal surfaces precision ground.
2. The jaws in all collets have extremely long bearing surfaces in relation to the diameter.
3. Collet jaw bearing surfaces always parallel to and in full contact with work, assuring accuracy and gripping power.



FOREMOST IN CHUCKS · FIRMEST IN GRIP

The *Jacobs* SPINDLE NOSE LATHE CHUCK

THE JACOBS MANUFACTURING COMPANY
20 Jacobs Road, West Hartford 10, Connecticut

If it's a JACOBS . . . it holds!

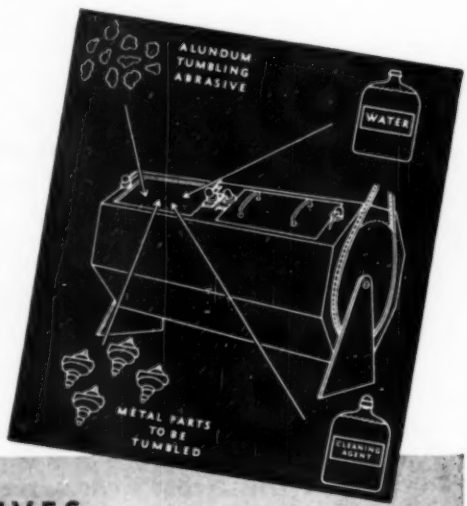
Take Advantage of the New NORTON TUMBLING SERVICE!

If you're finishing parts like these with expensive, hand-deburring and polishing methods, it will pay you to investigate the precision tumbling process and ALUNDUM Tumbling Abrasive—an ideal tumbling medium. Many progressive plants are using this cost-cutting combination to handle their most difficult finishing jobs.

Now we're prepared to help you test for yourself the advantages of this fast tumbling abrasive and this economical finishing process—without charge or obligation.

If you haven't installed tumbling barrels, and if you aren't familiar with this Norton abrasive product, send us sample parts (unfinished, finished as you'd like them, or required surface finish specifications). We'll tumble the unfinished parts for you—determine the best tumbling cycle—and will furnish you with this worthwhile information, which will help to prove how this product and process can save you time and money.

The chart at the right illustrates the basic elements included in this modern finishing process. If you'd like further details, send for a free copy of the Norton booklet, "Precision Tumbling with ALUNDUM Abrasive," or contact your Norton abrasive engineer or distributor.



NORTON COMPANY • Worcester 6, Mass.

Distributors in All Principal Cities

NORTON ABRASIVES

Accuracy Headquarters

FOR PRECISION CUTTING TOOLS and PRECISION GAGES

A. S. T. E. 1950
INDUSTRIAL COST-CUTTING
Exposition

NOT *One*
...BUT

It pays to buy Tools on a Performance Basis. But first you'll want the facts. Attend the April ASTE Show at Philadelphia, and you'll *get* the facts — at Accuracy Headquarters, Booth 815. There you'll see the wide range of Pratt & Whitney Precision Gages . . . Conventional Gages, Basic Measuring Equipment, Air-O-Limit and Electrolimit Comparators, Continuous Gages . . . on display and in action, actual proof of P&W's famed accuracy and cost-cutting efficiency. You'll also see the full line of Pratt & Whitney Precision Cutting Tools . . . taps, dies, end mills, reamers, milling cutters, carbide tools . . . every one of them a key factor in attaining maximum productivity and economy during competitive 1950.

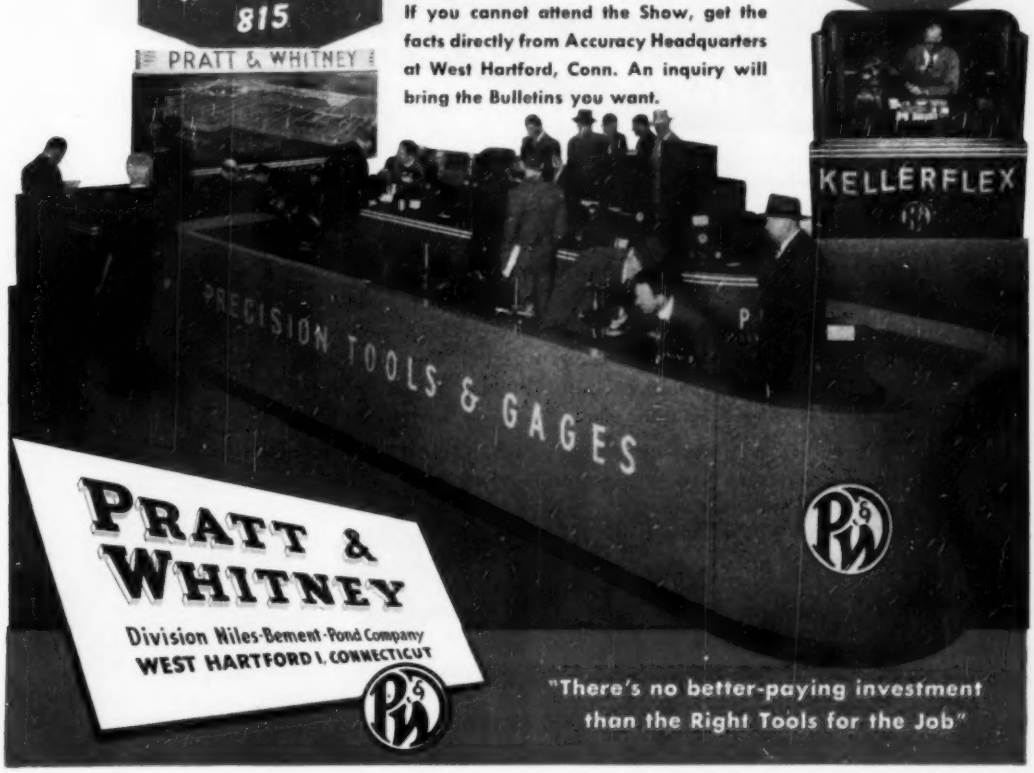
AT BOOTH 815

If you cannot attend the Show, get the facts directly from Accuracy Headquarters at West Hartford, Conn. An inquiry will bring the Bulletins you want.

And at Booth 632 you'll see why P&W KELLERFLEX Flexible Shaft Machine makes craftsmen — especially when tooled with KELLER Carbide DI-BURS, the new design in burs that produces harmless, granular chips, not painful slivers, from tough or hard metals.

Also see DIAFORM — the new P&W Precision Wheel Forming Attachment — form-dressing grinding wheels from a template, to tenth of a thousandth accuracy, in a matter of minutes.

AT BOOTH 632



PRATT & WHITNEY
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

"There's no better-paying investment than the Right Tools for the Job"

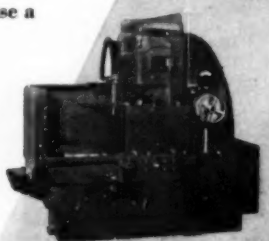
Housing Shortage? ... Put them on a Blanchard

A manufacturer was getting 1 to 2 gear case housings (right) per hour by a former method — now a Blanchard No. 18 is grinding the joint surfaces of 8 to 9 pieces per hour. Up to 3/16″ of cast iron is removed per piece. 3 pieces are produced in a single operation to required tolerance.

Thirty transmission housings per hour (left) are finish ground on a Blanchard No. 11, removing .010″ from previously machined castings. They are held flat to .001″ and to ±.002″ for size. A special Blanchard-designed holding fixture, actuated by a single wrench motion, helps produce these housings in such short time.

There will be no housing shortage in your plant if you use a Blanchard Surface Grinder—may we grind your samples to prove our point?

Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

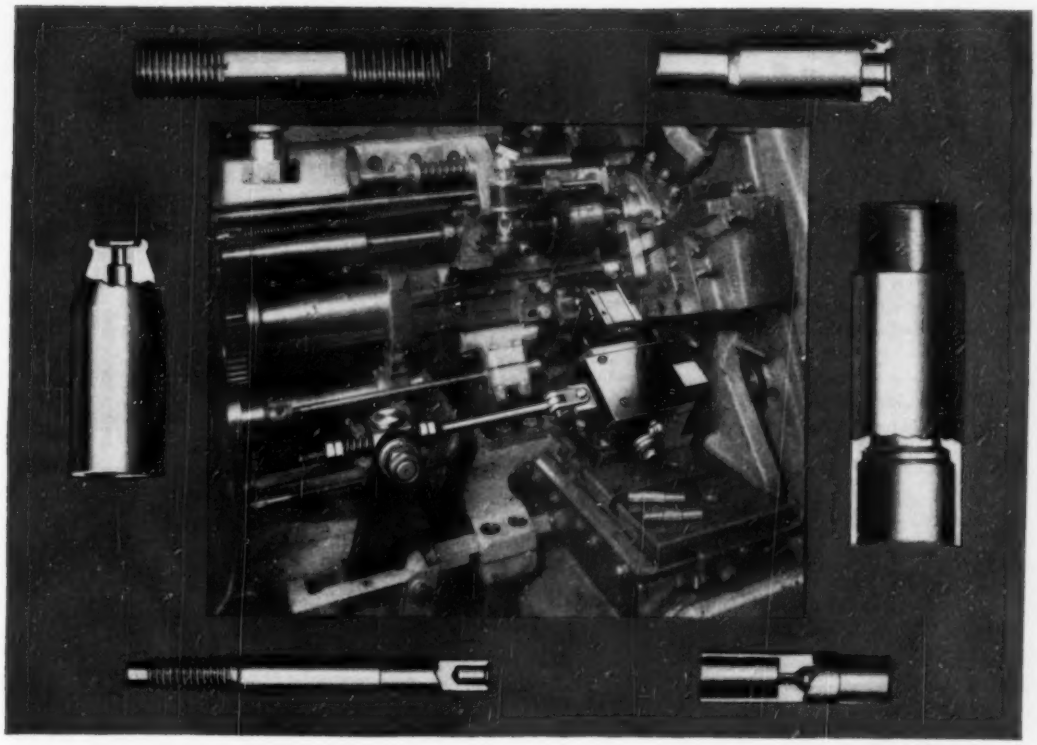


NO. 18 BLANCHARD SURFACE GRINDER

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



FINISH THIS DOUBLE OPERATION WORK *Faster!*

With the New National Acme Pick-Up and Transfer Attachment

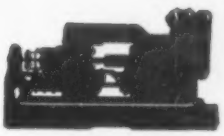
Here's a way to save machines, manpower and money.

The new National Acme Swinging Type Pick-Up and Transfer Attachment permits doing many second operation jobs on a first operation machine. *Think what that means:* fewer handlings, fewer machines, faster production—and less overhead, less floor space.

This special attachment—another example of how modern Acme-Gridley toolng methods give *"more good pieces in the pan"*—is available only as original equipment on bar machines of 9/16", 1" and 1¼" capacities.

With this new attachment you can finish both ends of a part in *one* double-indexing set-up. For example, the stud illustrated is completed in 9 seconds flat.

For additional examples of time-saving Acme-Gridley tooling methods, write for our new Bulletin TP-44.



***ACME-GRIDLEY BAR** and **CHUCKING AUTOMATICS** built in 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.*

THE NATIONAL ACME CO. 170 EAST 131st STREET CLEVELAND 8, OHIO

Will your new lathe

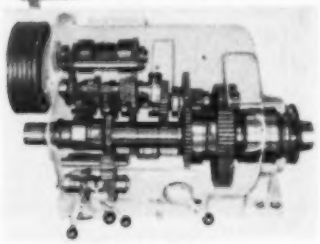
have *all* these important features?

You're not getting *all the value* your money can buy if your next lathe does not include *all* these important features. All these standard features, proved in operation, mean greater profits . . . in any size shop.

Many of the features listed here are exclusive with Lodge & Shipley "X" Lathes; others are not. But—no other lathe, only the Model "X" Lathe, combines *ALL* these profit-making features. DON'T BE SATISFIED WITH LESS!

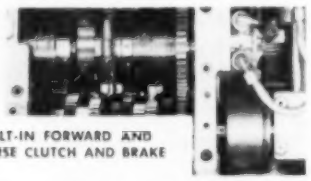
USE THESE FEATURES AS A CHECK LIST FOR YOUR NEXT LATHE

- 24 Spindle Speeds
- Built-in forward and reverse clutch and automatic brake
- Totally enclosed quick change gear box
- "Sustained alignment" bedways of hardened steel
- Positive feed clutches
- Inverted dovetail slides
- 3 bearing spindle mounting
- Slide rule calculator
- 20 H.P. in small sizes 30 H.P. in larger sizes
- All-Automatic lubrication
- Hardened cross-feed screw threads with compensating nuts
- Hardened spindle nose
- Sliding spur gears



24 SPINDLE SPEEDS

Why 24? Because fewer spindle speeds will not provide the most efficient cut speed for every tool and material. 24 speeds provide a more selective range from low-speed precision chasing up to the fastest carbide turning. The right speed means "More Profits".



BUILT-IN FORWARD AND REVERSE CLUTCH AND BRAKE

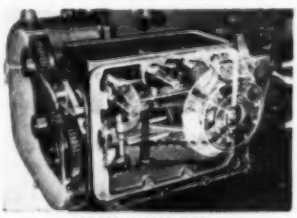
Gives easy control of carriage traverse for non-standard threading without use of reverse to leadscrew, spindle reversal for backing-off taps, and reverse spindle rotation for turning and boring where that is more advantageous. Do greater variety of work, get "Greater Profits".

"SUSTAINED ALIGNMENT" BEDWAYS of HARDENED STEEL

Exclusive Model X bedways guide carriage from front combined straight and angular way only. Thus the carriage cannot lift or bellmouth under the heaviest cuts. Renewable hardened and ground steel ways permanently located on the bed by a tongue and groove, make wear *immeasurable*. Produce finest work for years to come: "Sustain Profits"

SLIDE RULE CALCULATOR

Eliminating guesswork, tedious figuring and mistakes, the slide rule calculator takes the question mark out of speed settings. Calculator visually determines RPM and lever settings for most economical cut speeds for a given diameter. Eliminate guesswork; add "More Profits".



TOTALLY ENCLOSED QUICK CHANGE GEAR BOX

Patented, dial-operated control of 55 threads and feeds eliminates time formerly wasted trying to move old-fashioned sliding tumbler. Totally enclosed, oil tight box prevents foreign matter damaging precision gearing and makes possible automatic, *recirculating, lubrication*. Low maintenance costs spell "More Profits"

20 H.P. BUILT-IN TO SMALL SIZES 30 H.P. IN LARGER SIZES

Model "X" Lathes easily transmit 20 H.P. in the high range of small sizes and 30 H.P. in that of the larger sizes. Calculator shows maximum H.P. that may be transmitted at each RPM; Ammeter (optional, extra cost) indicates H.P. supplied to the machine. With this combination an operator can safely use the greater H.P. available. More Horsepower means "More Profits"

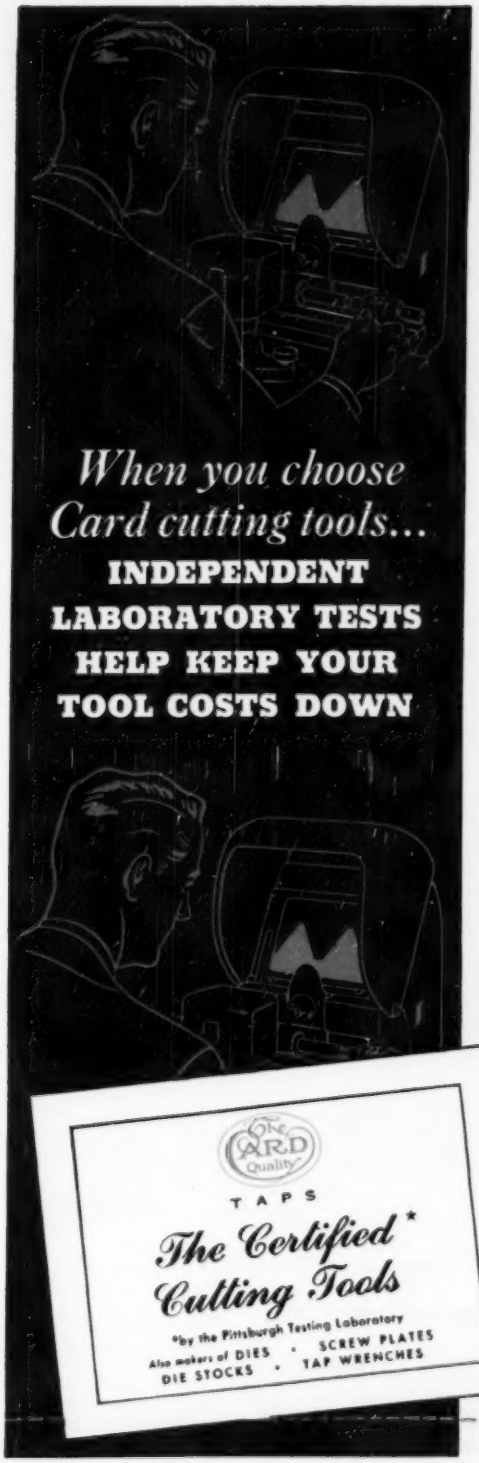
INVERTED DOVETAIL SLIDES

Don't let "pared down" swing capacity limit your range of work. *Greater swing* over the cross slide and greater strength in the compound rest assembly have been attained by the unique inverted dovetails construction. The cross slide is appreciably lowered in all sizes of Model X Lathes. Machine a wider range of work; "Increase Profits".

Write for new "Features Catalog #200" for full information on these essential features for the lathe buyer. Use company letterhead, please.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

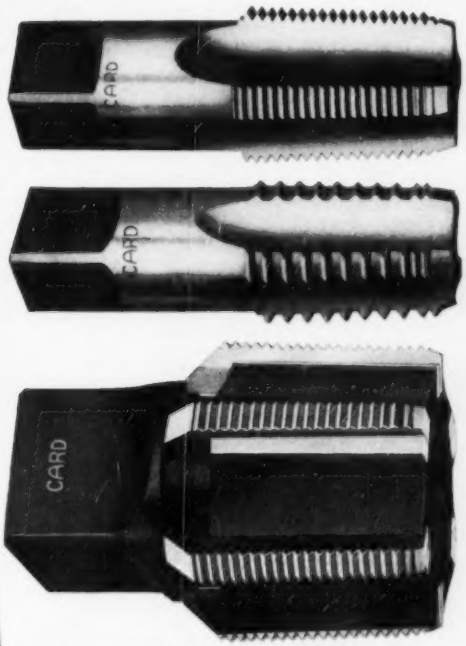


WHEN our tool inspectors put their "OK" on Card cutting tools we don't take their word for it!

Although we make Card tools meet the highest standards in factory inspection, we've engaged the famous Pittsburgh Testing Laboratory to make independent tests of our taps which they buy on the open market . . . just as you do. The results of their tests for hardness and dimensional accuracy are then *certified*.

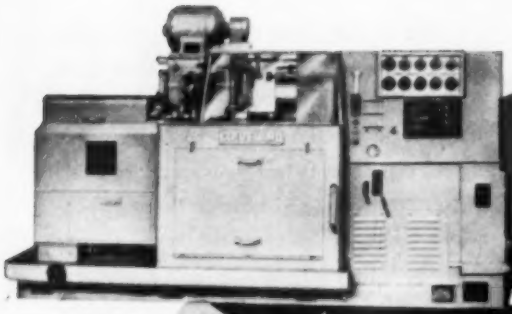
This means that when you invest in a Card tap, you've got that *extra assurance* of quality that means top performance on the job.

And for prompt service . . . your nearby Card Distributor is set up to fill your needs to perfection.



S.W. CARD

MANUFACTURING COMPANY
Mansfield, Massachusetts
DIVISION OF UNION TWIST DRILL CO.



all kinds of parts . . . from a variety of materials . . . fast, accurate, at low cost

with the new DIALMATIC CLEVELAND

Model AB 2½" Single Spindle Automatic

ADJUSTING SCREW Close tolerances. From SAE 5120 hot rolled steel.

ALUMINUM CAMERA PART Exceptionally good finish and close tolerances held.

GEAR BLANK High production part from SAE 1050 cold rolled steel.

SPOOL Formed from free machining brass.

REDUCING BUSHING From SAE 1112 cold rolled steel. Commercial thread tolerances closely held.

SHOULDER BEARING From free machining brass. Fine finish important.

DIE CASTING INSERT Requires exceptionally good finish. From SAE 1112 cold rolled steel.

SHOWN here are a few samples of *profitable* production being turned out by prominent, cost-conscious manufacturers on new Dialmatic Clevelands.

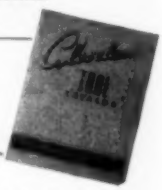
The Model AB Dialmatic Cleveland is fast and accurate, rigid and powerful. Just consider this: Here, in one machine having a 2½" bar capacity, is a spindle speed range that permits you to thread 2½" diam. alloy steel down as low as 16 sfm—or work ⅞" free machining brass at 416 sfm! 112 spindle speed selections are available.

And set-up time is *short! Electric Feed Drive* operates all five turret tools (a 6-hole turret is supplied when required). Forward and return turret tool feeds are simply set by positioning dials on the control panel. Double cross slides operate by standard cams mounted on adjustable drums.

More versatile than any other automatic, the Model AB Cleveland is quickly and easily *converted to a chucker*—ideal for shops having an occasional chucking job to run in addition to their bar work.

Why don't *you* find out *now* if the new Dialmatic Cleveland can cut the cost of your production? Ask Camco engineers to submit a direct proposal with production estimates on your work. For complete machine specifications, write for bulletins.

The Cleveland Automatic Machine Co. manufactures and stocks a complete line of STANDARD TOOLING and COLLETS for use with Cleveland Automatics. Prompt deliveries. Write for complete information.



Remember, *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • NEWARK

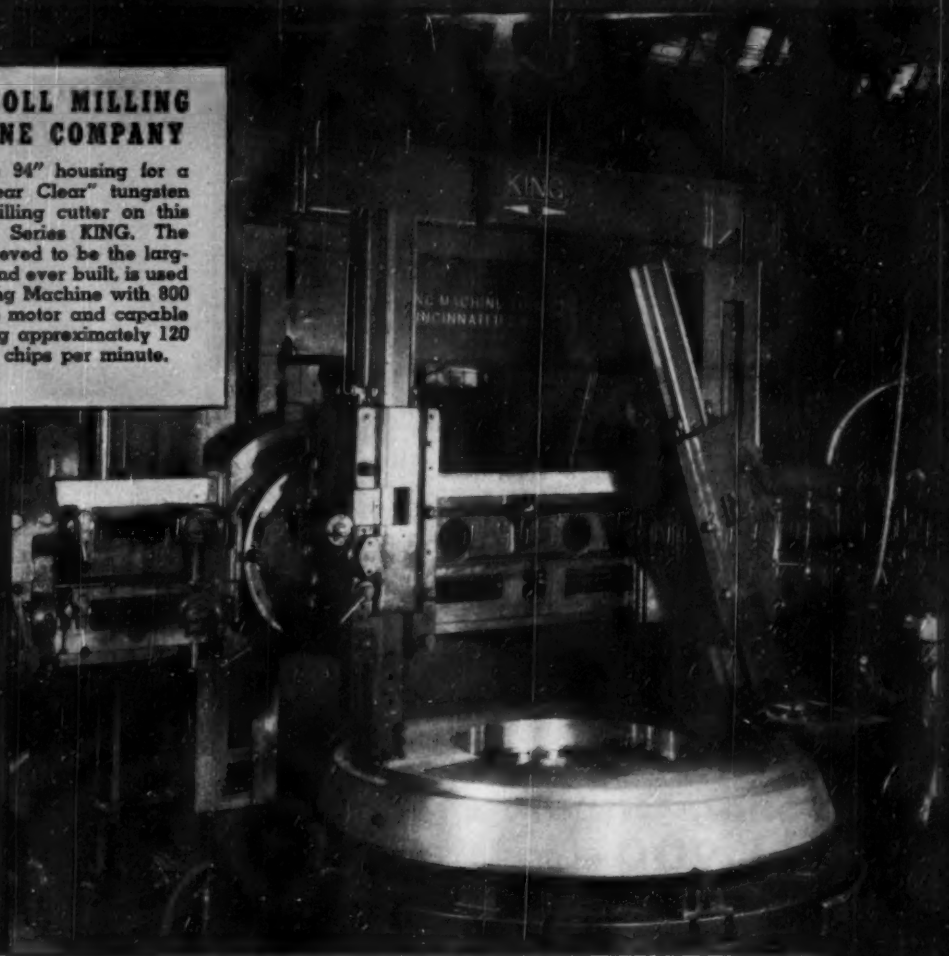
Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

BIG THINGS ARE BEING DONE BY KING

VERTICAL BORING & TURNING MACHINES

INGERSOLL MILLING MACHINE COMPANY

turned the 94" housing for a giant "Shear Clear" tungsten carbide milling cutter on this 100" New Series KING. The cutter, believed to be the largest of its kind ever built, is used on a Milling Machine with 800 H. P. drive motor and capable of removing appreximately 120 bushels of chips per minute.



New savings in machining time, increased production, improved quality of work—these, too, are "big things" being accomplished by KING Vertical Boring & Turning Machines the nation over . . . Ten sizes: 30", 36", 42", 52", 62", 72", 84", 100", 120", and 144" . . . New catalogs now available. When writing, specify size machines which your work requires.

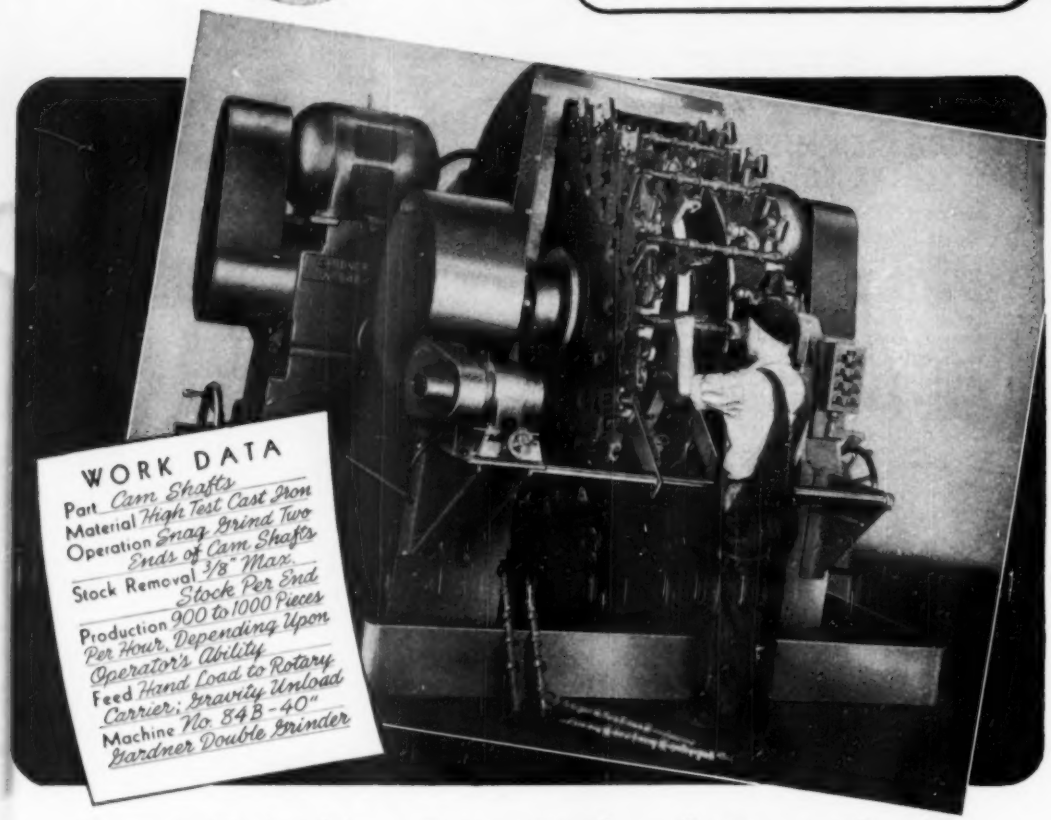
KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

Double GARDNER-GRINDING

_ makes unit costs come down!


WORK DATA
Part Cam Shafts
Material High Test Cast Iron
Operation Snag Grind Two Ends of Cam Shafts
Stock Removal 3/8" Max. Stock Per End
Production 900 to 1000 Pieces Per Hour, Depending Upon Operator's Ability
Feed Hand Load to Rotary Carrier; Gravity Unload
Machine No. 84B-40" Gardner Double Grinder

Snag-Grinding Two Ends of Cam Shafts, at 900 to 1,000 Pieces Per Hour!

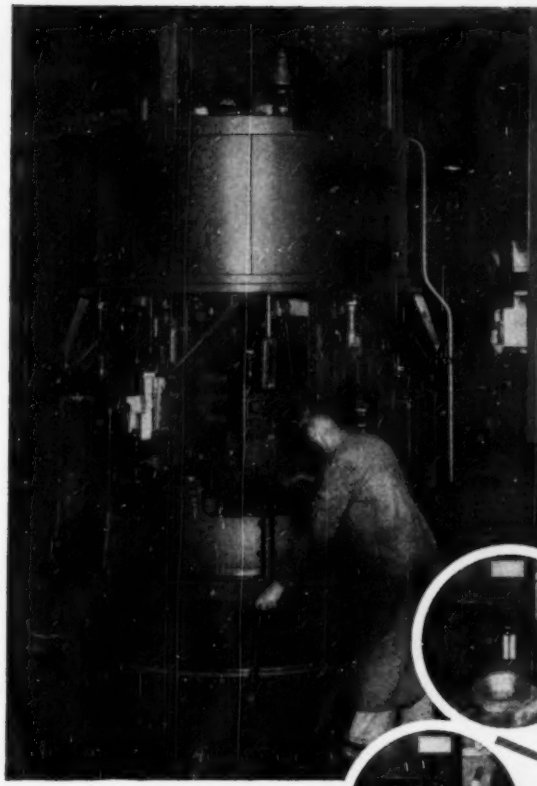
GARDNER-GRIND *Your Flat Surfaces*

LOWER unit costs with higher production . . . that's the job this No. 84B-40" Gardner Double Grinder is doing in one automotive plant. Check the accompanying Work Data Sheet. Perhaps you have a similar grinding operation which could be done quicker and better with a Gardner Double Grinder. Let us show you how you can "meet the market" with lower unit costs in your parts production.

Write for our DOUBLE GRINDING Bulletin!

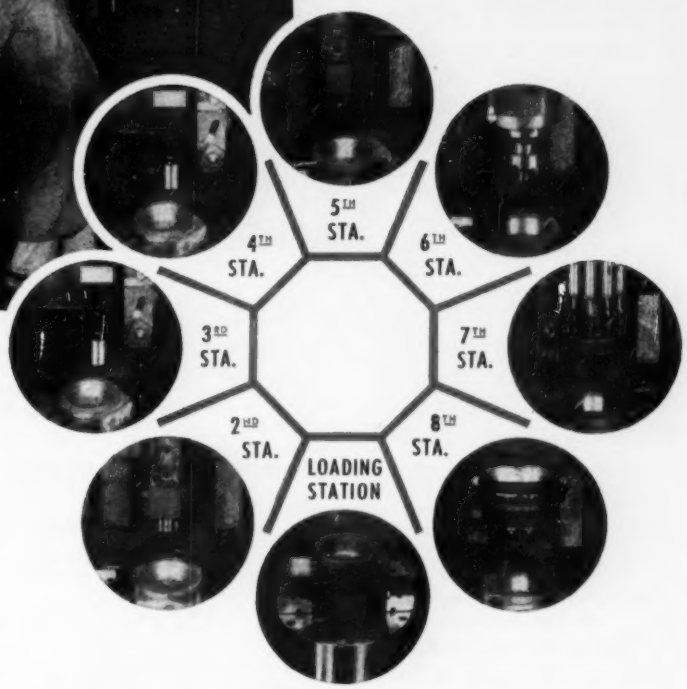
GARDNER MACHINE COMPANY

410 EAST GARDNER STREET . . . . BELOIT, WISCONSIN, U.S.A.



A KEY UNIT TO LOWER COSTS

Whether Mult-Au-Matics are tooled for versatility on a variety of the shorter run jobs or tooled for volume production, users have for many years proclaimed these machines "Key units in lowering our manufacturing costs".



1st Station—:
Loading

2nd Station—:
Rough Bore—Three Diameters

3rd Station—:
Rough Face—Three Surfaces

4th Station—:
Finish Face—Three Surfaces

5th Station—:
Finish Bore—Three Diameters and Chamfer

6th Station—:
Precision Bore—Two Diameters

7th Station—:
Multiple Drill—Ten Holes

8th Station—:
Multiple Tap—Ten Holes

Many of today's economic problems are being solved through lower manufacturing costs. A Mult-Au-Matic installation may be the solution to some of YOUR PROBLEMS.

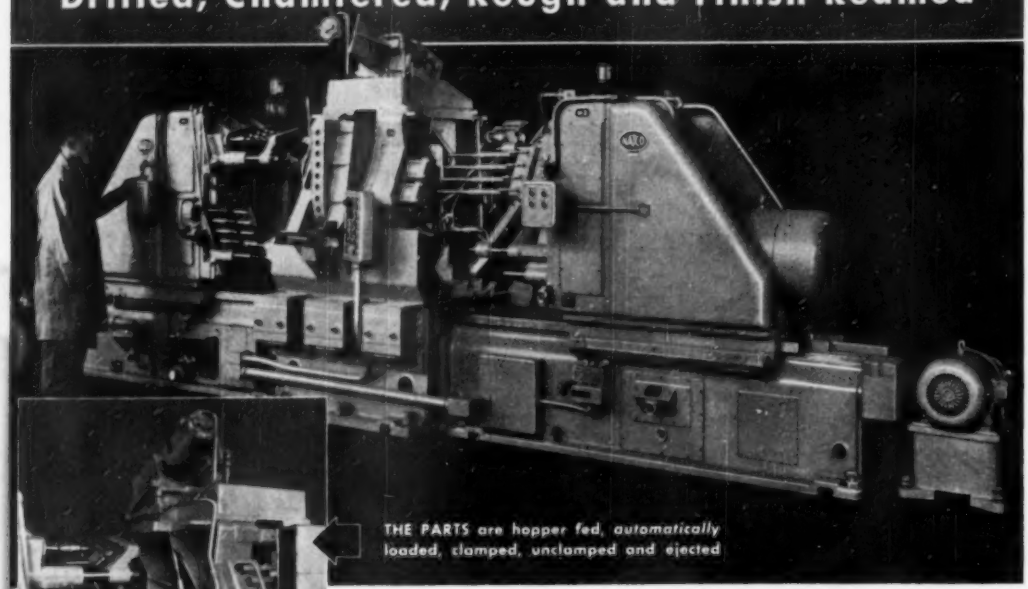
Let Bullard engineers study your manufacturing methods with a view towards reducing your manufacturing cost via the Mult-Au-Matic Method. Write for Mult-Au-Matic "Pictorial".

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

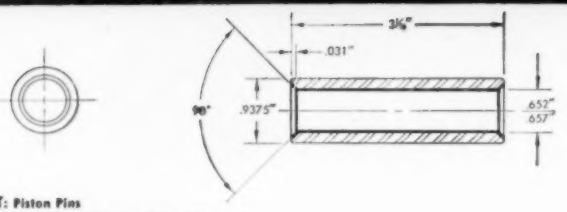
575 PISTON PINS PER HOUR

Drilled, Chamfered, Rough and Finish Reamed



THE PARTS are hopper fed, *automatically* loaded, clamped, unclamped and ejected

Chip conveyor attached to rear of fixture pedestal runs in under fixture and carries chips out of machine.



PART: Piston Pins

PRODUCTION: Approximately 575 parts per hour

OPERATIONS:

Position No. 1
Load four parts automatically

Position No. 2
Right and Left Hand Heads
Drill for .652" dia. 1/5 through

Position No. 3
Right and Left Hand Heads
Drill for .652" dia. 2/5 through and chamfer I.D.

Position No. 4
Right Hand Head
Drill for .652" dia. across center
Left Hand Head
Idle

Position No. 5
Right Hand Head
Rough ream through using accelerated spindles
Left Hand Head
Idle

Position No. 6
Right Hand Head
Idle
Left Hand Head
Ream through to .652/.657" dia. using accelerated spindles

Position No. 7
Unload four parts automatically

This is just one of many examples of the way NATCO machines contribute to higher production and lowered costs. Send us your drilling, boring, tapping and facing problems . . . our engineers have the solution.

Write today for NATCO "Success Story" No. 3 and investigate . . .

NATCO DRILLING, BORING, TAPPING AND FACING MACHINES

NATCO

Call a Natco Field Engineer

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Ind., U. S. A.

Branch Offices: 1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit • 1807 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City

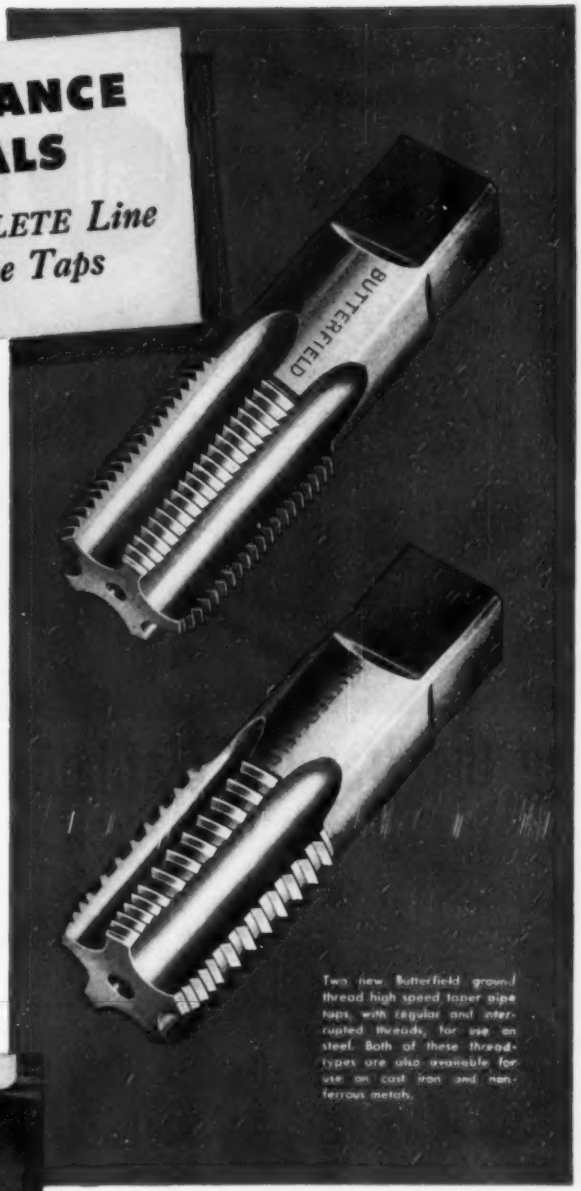
TOP PERFORMANCE IN ALL METALS

With Butterfield's COMPLETE Line of 100% Inspected Pipe Taps

Working with some of the largest industrial users, Butterfield has achieved distinct advancements in the performance of pipe taps. Notably, in the development of a special type for steel and another for cast iron and non-ferrous metals — both of which have been thoroughly proved in actual use.

Among other Butterfield contributions in the pipe-tap field you'll find a full range of dryseal-form taps, taper and straight, with ground threads. Eliminating the annoyance of compounds, their Butterfield-engineered accuracy is your assurance of faster, easier, lower-cost sealing of joints and fittings.

Butterfield taper pipe taps are available with ground or cut threads, regular or interrupted, also regular straight, in high speed steel and with regular taper or straight threads in carbon steel — *all individually inspected* . . . See your nearby Butterfield distributor for prompt service. Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont. *In Canada:* Rock Island, Quebec.



Two new Butterfield ground thread high speed taper pipe taps, with regular and interrupted threads, for use on steel. Both of these thread-types are also available for use on cast iron and non-ferrous metals.

Checking pitch diameters with wires, by the pressure method. Some of the specialized equipment used in Butterfield's 100% inspection.

BUTTERFIELD

THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

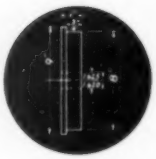
TAPS • DIES • REAMERS • SCREW PLATES

all in a day's work

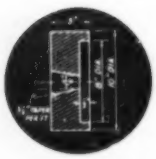
on the Tray-Top Cintilathe

- **Small work diameters, large work diameters**
- **Alloy steels, soft steels, cast irons, non-ferrous metals**
- **Turning, facing, drilling, boring, reaming, threading, tapping**
- **Roughing cuts, finishing cuts**
- **Tools of high speed steel—tools of cemented carbide**

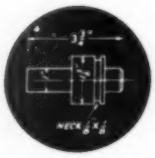
material:	aluminum	
tools:	H.S.S.	
operation	speed	feed
face	1200	.015
turn	1200	.018
ctr. drill	1200	H
drill	1200	H
tap	315	H



material:	CMM 320	
tools:	carbide	
operation	speed	feed
face	608	.018
ctr. drill	1200	H
turn	842	.020
neck	315	H
chamfer	449	H



material:	cast iron	
tools	carbide	
operation	speed	feed
face	842	.015
turn	842	.018
ctr. drill	842	H
drill ⅞	608	H
drill 1½	161	H
co-bore	842	.015
taper turn	842	.018



material:	SAE 3150	
tools:	H.S.S.	
operation	speed	feed
face	82	.013
turn	42	.020
ctr. drill	608	H
drill ⅞	608	H
drill 1½	161	H
bore	315	.020
ream	60	H

All demand a wide range of spindle speeds! And Tray-Top is the **only** economy-priced light duty lathe that gives you **twelve speeds—all geared**—in geometrical progression, 40 to 1 overall ratio. Quick, 3-lever speed selection with direct-reading "color match" dial. A choice of three speed ranges: 20 to 820, 30 to 1200, 45 to 1800 rpm . . . Totally enclosed quick change gear box . . . 48 thread and feed changes . . . flame hardened gears in headstock, change gear box and apron . . . convenient "parking space" for tools, etc.—these and many other features make Tray-Tops

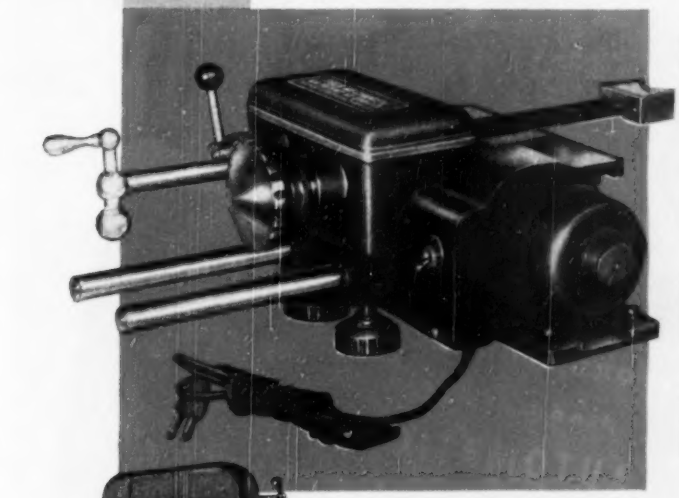
OF OUTSTANDING VALUE

Write for Bulletin TEL 100-3.

CINCINNATI LATHE & TOOL CO.

Cincinnati 9, Ohio, U.S.A.

See it in operation at the TOOL ENGINEERS SHOW—Booth 105



NEW AUTOMATIC POWER FEED

walker-turner DIVISION

ON THE WALKER-TURNER 16" BAND SAW

Just one of many examples of how Walker-Turner machine *design* helps the metalworking industry

CUT PRODUCTION COSTS

If you're interested in more efficient production methods (and who *isn't* these days!), you'll make the Walker-Turner Booth — 105 — your first stop at the A.S.T.E. Exposition in Philadelphia.

You'll want to see such outstanding developments in machine design as the new Automatic Power Feed, which makes the Walker-Turner 16" Band Saw truly a *cost-cutting* machine.

You'll want to inspect and operate the other machines in this complete line . . . to see at first hand how Walker-Turner *design* helps you do a better job . . . faster . . . for less.

So whatever you do, wherever you go at the Tool Show, don't miss Walker-Turner's "Cost-Cutting" Exhibit at Booth 105.

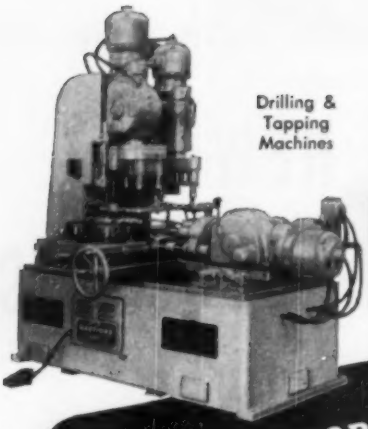
See you at the Show!

DRILL PRESSES • RADIAL DRILLS • TILTING ARBOR SAWS
BELT and DISC SURFACERS • METAL CUTTING BAND SAWS

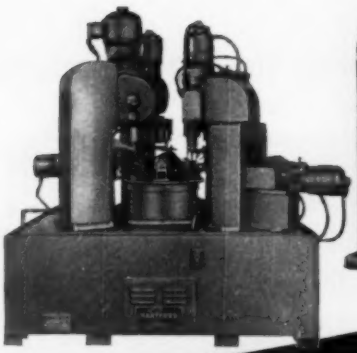
KEARNEY & TRECKER MILWAUKEE

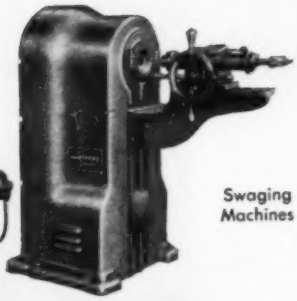
WALKER-TURNER DIVISION

PLAINFIELD, NEW JERSEY



Drilling & Tapping Machines





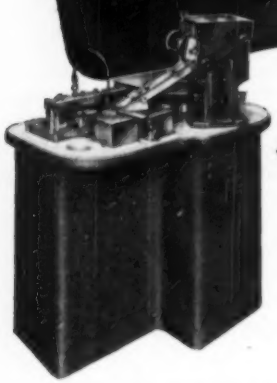
Swaging Machines

THE HARTFORD SPECIAL MACHINERY CO.

HARTFORD, CONNECTICUT

producers of

AUTOMATIC
DRILLING & TAPPING MACHINERY
SWAGING MACHINES
HAMMERING MACHINES



in addition to our

Automatic THREAD ROLLERS

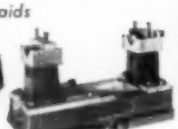
DIE POLISHING MACHINES

and complete line of special machinery built to specification

We also manufacture exclusively these famous shop aids

Super-Spacers"

Four-Point Milling Vises



"V-Block" Milling Fixtures

HARTFORD *Special*

...the standard for special machinery

How COSTS were CUT 40%

IN THE PRODUCTION OF THIS STEEL SCREW

...by replacing a .40 Carbon Alloy Steel with STRESSPROOF

This cylinder sleeve puller screw was originally made of .40 carbon alloy steel at a cost of $1.364 per part. By changing to STRESSPROOF furnace-treated bar stock, the manufacturer was able to cut his steel cost, eliminate heat treating, and reduce machining time. As a result, the cost of the finished part dropped to $.818—a net saving of 40%.

STRESSPROOF has made similar savings in hundreds of other cases. Here are four reasons why: 1. STRESSPROOF eliminates heat treating—its *in-the-bar* strength is twice as great as ordinary cold-finished shafting; 2. STRESSPROOF eliminates case hardening—its resistance to wear as machined is sufficient to replace many heat-treated or carburized steels; 3. STRESSPROOF has *in-the-bar* machinability fully 50% better than that of heat-treated alloys of the same hardness; 4. STRESSPROOF is stress-relieved—assuring an absolute minimum of distortion. And yet, this bar costs little more than ordinary cold-finished carbon bars. Available in cold-drawn or Ground and Polished finish.

Stocked by Leading Steel Warehouses

La Salle STRESSPROOF*

Reg. U.S. Pat. Off.

SEVERELY COLD-WORKED FURNACE-TREATED STEEL BARS

***Mfr. of the Most Complete Line of Cold-Finished and Ground and Polished Bars in America**

SEND for FREE

ENGINEERING BULLETIN

"New Economies in the Use of Steel Bars"

LaSalle Steel Co.
1416 150th Street
Hammond, Indiana

Please send me your STRESSPROOF Bulletin.

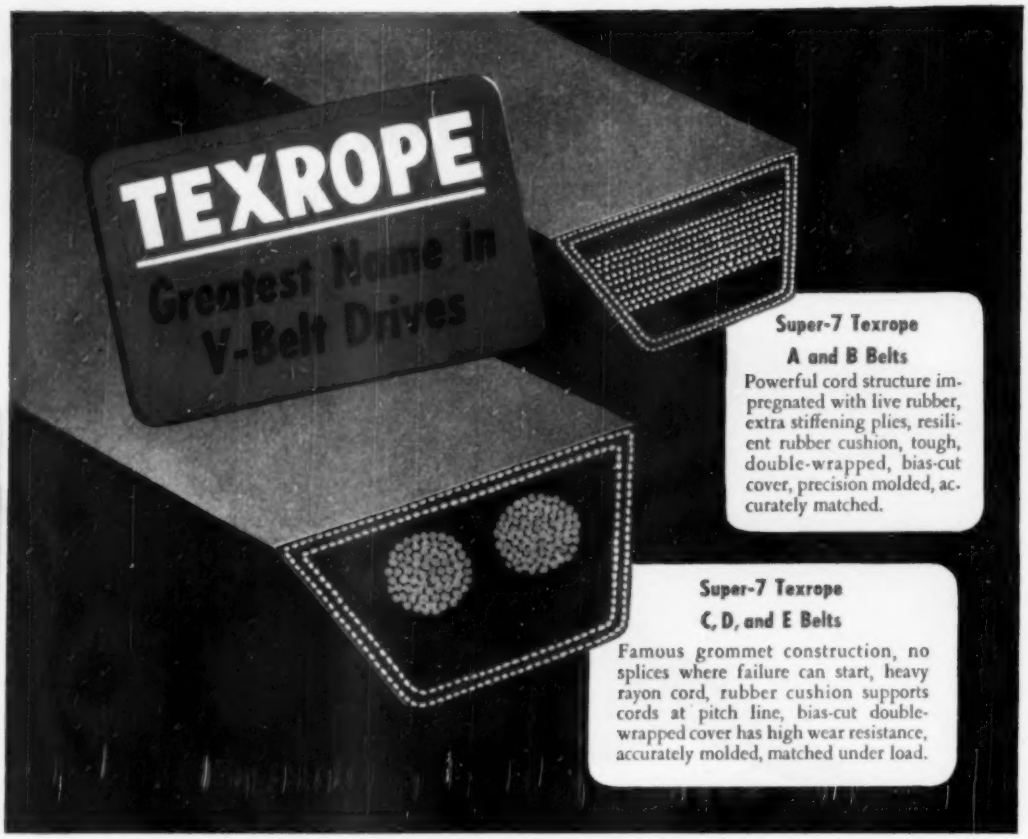
Name_____

Title_____

Company_____

Address_____

City_____ State_____



Super-7 Texrope
A and B Belts

Powerful cord structure impregnated with live rubber, extra stiffening plies, resilient rubber cushion, tough, double-wrapped, bias-cut cover, precision molded, accurately matched.

Super-7 Texrope
C, D, and E Belts

Famous grommet construction, no splices where failure can start, heavy rayon cord, rubber cushion supports cords at pitch line, bias-cut double-wrapped cover has high wear resistance, accurately molded, matched under load.

LONG LIFE FOR YOUR DRIVES

YOU GET MORE than good belts when you standardize on *Super-7 Texrope* V-belts in your plant. You also get the benefit of the greatest V-belt experience in the world. This means you are sure of exactly the right drive for longest life on your job. *Texrope* Drive Department of Allis-Chalmers originated the multiple V-belt drive and there are more *Texrope* multiple V-belt drives in operation than any other make.

High Capacity Belts

These belts have extra strong cords, special rubber cushion and tough neoprene cover to give them 40% greater capacity than standard belts at proportionately higher price. Recommended only for applications where space is limited or other special conditions demand a heavier duty belt. Made in A, B, C, D and E sections.

Complete V-belt Service

Get everything you need for your V-belt drives . . . new and replacement V-belts, standard and variable speed sheaves and speed changers . . . from one reliable source. 144 page *Texrope* Pre-engineered Drive manual covers 90% of requirements. Get your copy today from your A-C Authorized Dealer or Sales Office or write for Bulletin 20B6956.

Texrope and *Super-7* are Allis-Chalmers trademarks. *Super-7 Texrope* V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices.

ALLIS-CHALMERS, 999A SO. 70 ST. A-3021
MILWAUKEE, WIS.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS

Now Cuts No. 347 Stainless

33 1/3% faster using ATKINS "Silver Steel" BLADES

● CASE STUDY

Material: 3¼" diam. bars of No. 347 type stainless steel.

Previous Cutting History: After 12 to 14 cuts molytype blades used became dull, with cutting time excessive. Varying machine speed, coolant and pressures did not help.

Recommendation: Change-over to Atkins High-Speed "Silver Steel" Blade No. 614P.

Result: Time per cut reduced from 15 to 10 minutes. Number of cuts per blade increased from maximum of 14 to new high of 32, with blade still satisfactory for lighter-duty work after 32 cuts.

This Performance Report Has a Moral for You:

If you have tough cutting jobs — or any job on which blade wear, cutting time and machine down time are excessive, investigate Atkins "Silver Steel" Blades. User reports consistently show that Atkins "Silver Steel" Hack Saw Blades can and do out-wear and out-cut ordinary blades — frequently by a wide margin. Put Atkins in your machines and check results. Tell your Atkins Distributor you want to make this test now!

See Your Industrial Distributor First

10 SECONDS TO CUT 2½" ELECTRIC CAST STEEL

ATKINS "Curled-Chip" MILLING SAWS

Another example of Atkins "Curled-Chip" Milling Saws in action! Smooth "Curled-Chip" cutting action allows faster cutting speeds, heavier feeds — cleaner, truer cuts that need less re-machining. Ask for a demonstration on your own work.

ATKINS
"ATKINS ALWAYS AHEAD"

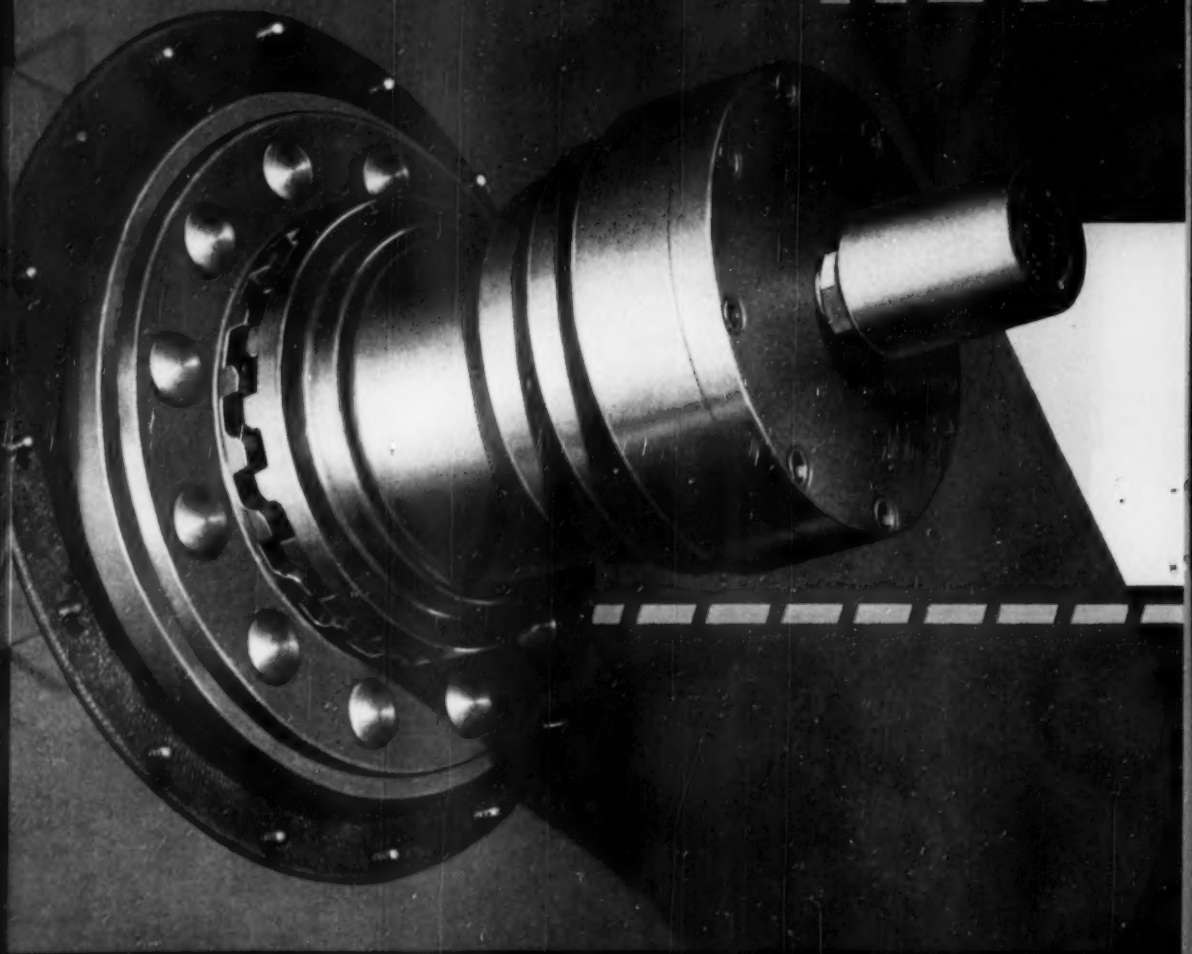
E. C. ATKINS AND COMPANY

Home Office and Factory: 402 S. Illinois Street, Indianapolis 9, Indiana
Branch Factory: Portland, Oregon *Machine Knife Factory:* Lancaster, New York
Branch Offices: Atlanta • Chicago • New Orleans • New York

MAKERS OF BETTER SAWS FOR EVERY CUTTING JOB

NIAGARA

NEW



This most revolutionary improvement in press design since Niagara introduced the world famous sleeve clutch in 1934 has been in the process of development and testing for many years. It is patented and there are patents pending.

Its high hourly output . . . its sturdiness . . . its simplicity . . . its labor saving and maintenance economies . . . its safety features . . . are amazing.

ANNOUNCES

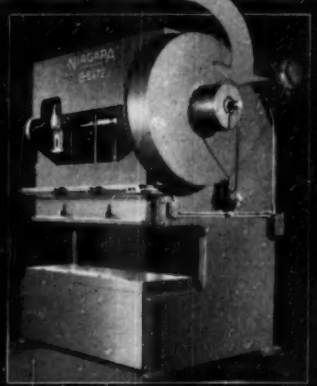
SLEEVE CLUTCH

electrically controlled air actuated

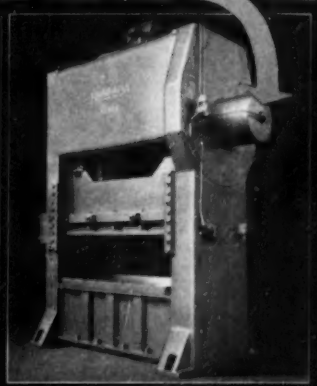
DeLuxe Control

Note each one of these outstanding features:

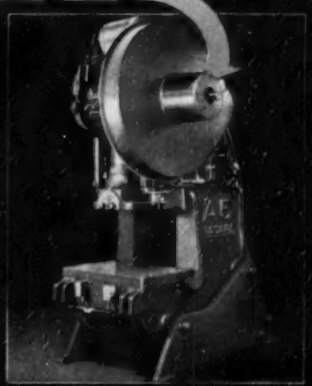
1 Has all the advantages of a friction clutch.
2 Has all the advantages of a Sleeve Clutch.
3 Can be engaged or disengaged at any point in the stroke.
4 Can be jogged through the full 360° of crankshaft travel.
5 Can be stopped instantly, regardless of position of crank, by stop button, electric eye, limit switch or high frequency electric field.
6 Can be operated by palm buttons, foot switch or push buttons.
7 Can operate single stroke or continuous.
8 Provides positive drive.
9 Has no friction members to wear.
10 Generates no heat.
11 Has low air consumption.
12 Makes instant engagement.
13 Provides effortless operation.
14 Is located on outside of drive wheel.
15 Can be completely removed without taking off the drive wheel.
16 Drive wheel next to frame . . . minimum overhang.
17 Drive wheel runs on anti-friction bearings.
18 Gears and clutch run in a bath of oil.
19 Has few moving parts. Integral jaws and splines.
20 Presses so equipped are provided with air releasing brake.



For Double Crank Gap Presses



For Straight Sided Presses



For Inclinable Presses

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, NEW YORK

DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK

For those tough *Special* jobs that just have to be right... depend on

NATIONAL TOOL CO.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

FORM-RELIEVED CUTTER five-section interlocking type, custom engineered for milling helical pump rotors

A PARTIAL LIST OF *Special* TOOLS ENGINEERED AND MANUFACTURED BY

Gear Shaper Cutters	Milling Cutters	Chamfering Cutters
Herringbone Gear Cutters	Broaches	Rotary Gear Cutters
Ground and Unground Gear and Spline Hobs	Tungsten Carbide Tools	Circular Form Tools
Master Gears	Sprocket Cutters	Gang Cutters
	Profile Form Mills	Flat Form Tools

NATIONAL TOOL CO.
Cleveland 2, Ohio

Representatives in major industrial centers

TRI CLAD MOTORS

REG. U.S. PAT. OFF.

will run safely without relubrication for as long as any general-purpose motor you can buy—

and if the application makes relubrication a *must*, you can grease a **TRI CLAD** *without* halting production

GENERAL ELECTRIC

HERE'S WHY

TRI CLAD MOTORS will run safely without relubrication for as long as any general-purpose motor you can buy—

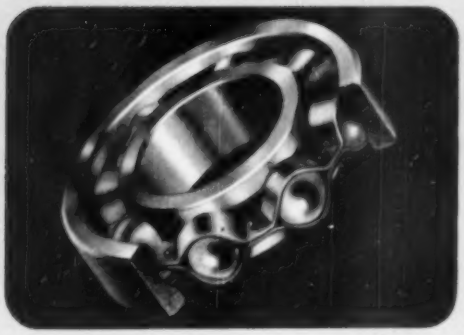
Tri-Clad extra lubrication "protection" can save you money because:

1. Tri-Clad's oversize grease reservoir and the heaviest standard-service bearings mean you do not have to bother with greasing between motor check-ups.

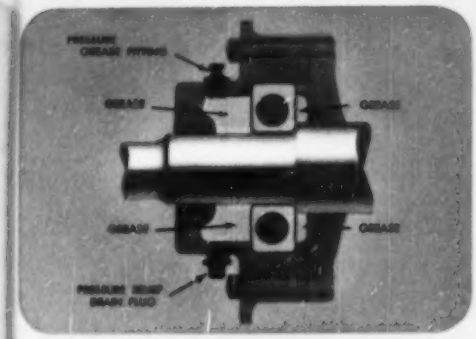
2. When relubrication is needed on those tough applications, you can grease a Tri-Clad without interrupting production-line operations.

Tri-Clads are grease-gun easy to lubricate *on the job*. Moreover, a Tri-Clad motor will run safely where an ordinary motor would fail. Chances are you'll be spared the cost of a "special" motor.

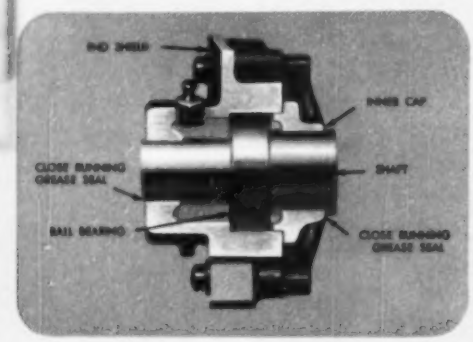
YOU BE THE JUDGE! The best way to prove to yourself that Tri-Clad gives you the most for your motor dollar is to contact your local G-E office. Tri-Clad stocks are complete. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*



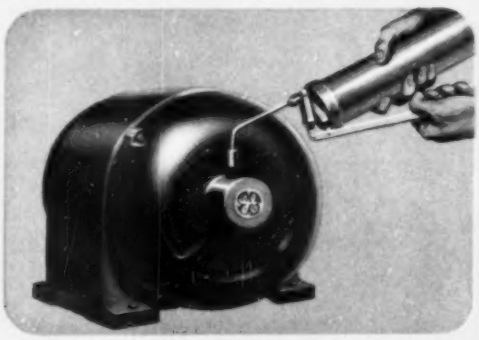
1 **EXTRA BEARING PROTECTION** — Tri-Clad gives you extra bearing protection because heaviest standard-service bearings are carefully selected to withstand severe loads for long periods.



2 **EXTRA GREASE** — Four times the ordinary amount of grease is packed into the large Tri-Clad grease reservoir. Since bearing life depends on grease, this means that Tri-Clad motors will run safely for years — for as long as any general-purpose motor you can buy.



3 **SEALED-IN BEARINGS** — Bearings and grease are completely sealed in a cast housing with long running seals for extra protection from dirt, dust, and lubricant leakage.



4 **PRESSURE-RELIEF GREASING** — An efficient system of pressure-relief lubrication (with standard fittings) enables a Tri-Clad motor to be quickly and easily greased on the job when and if it's needed.

GENERAL ELECTRIC

NEW
CONTROLLED-POWER CHIPPING HAMMER

selected to fit operator's preference enabled him

to produce

184% additional work . . .

. . . when tested

against hammer picked at random from production floor

These new hammers enable the operators to produce more with less effort.

Controlled-Power Chipping Hammers provide added power under "stalled-cut" conditions . . . they eliminate valve choking and short-stroking of pistons . . . they provide smooth power, automatically responding to the demand for more air . . . they give immediate starting with full power . . . they permit smooth, graduated cutting . . . *they give you a selection of 15 power sizes where formerly you had only 5.*

Let us arrange a similar test in your shop, under your conditions and with the metals you are chipping. The results will enable you to determine what hammer replacements will be profitable.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 482-B

TEST DATA*

The new size E2A Controlled-Power Hammer was tested against three comparable 2" Stroke Hammers currently in use in customers plants. All tests were made with 85 lbs. air pressure at the tools and for a duration of 30 seconds.

Test No. 1

E2A Controlled Power Hammer Serial 907	2.45 oz.
2" Stroke Hammer (Brand New) Serial 109,534	1.84 oz.
Gain	.61 oz. or 33%

Test No. 2

E2A Controlled Power Hammer Serial 907	2.45 oz.
2" Stroke Hammer Serial 54272 (Selected as above average)	1.24 oz.
Gain	1.21 oz. or 97%

Test No. 3

E2A Controlled Power Hammer Serial 907	2.45 oz.
2" Stroke Hammer Serial 64099 (Picked at random by customer)	.86 oz.
Gain	1.59 oz. or 184%

Test No. 3 indicates nearly 3 times as much chipping by the New Controlled-Power Hammer! . . . or a phenomenal 184% additional work against the hammer picked at random from the customers production floor.

The "pay-off" time for new hammers as developed by the tests would be as follows

Cost of the man—$1.30 per hr. x 8 hrs. = $10.40 per day

184% *additional* work represents $19.14 in *additional* production.

The New Controlled-Power Hammer costs $85.00 each.

$\frac{\$85.00}{\$19.14}$ = 4.44 days or 35.52 hours pay-off time!

Actually less than 40 hours to pay off the cost of the new labor-aiding, time-saving machines.

**A similar test can be made in your shop to determine the savings that can be made. Fill out the coupon and mail it today.*

INGERSOLL-RAND CO. DEPT. P.T.
11 Broadway, New York 4, N. Y.

Gentlemen: We are interested in cutting our chipping costs and making the operator's job easier.

☐ Send descriptive folder on new Controlled Power Hammer.

☐ Would like to discuss details of making a test in our shops.

Name_____

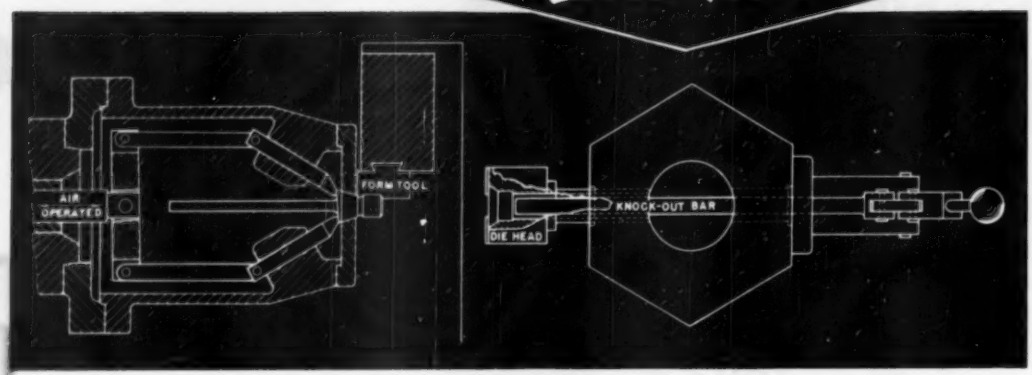
Company_____

Address_____

City_____ State_____

YOU CAN USE IDEAS

Like This

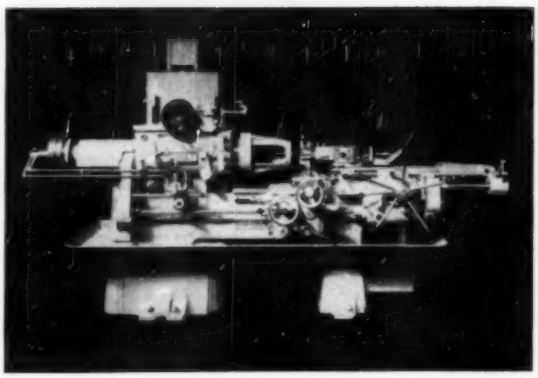


WITH GISHOLT TURRET LATHES

Here's a turbine blade job. It is a tough job to hold because not only are there a number of different blades, each of different length, but the work must be located and held against a tapered surface. It requires a special fixture. An air-operated plunger through the spindle forces the taper against the locating seat on the fixture, holding all sizes firmly.

The machining is done on the shank end. It must be turned and faced and necked for thread relief. Form tools on the rear of the cross slide handle all this in a single pass. Threading is done from the turret and a hand-operated knock-out bar loosens the blade from the fixture after the threading is completed. Production is more than adequate to meet the contract requirements.

This kind of investment pays off handsomely. If you are looking for practical, cost-cutting ideas, why not let Gisholt engineers help you. They have been specialists in turret lathe work for over 60 years.



Gisholt lathes are ideal for high speed work of this kind. With hydraulic spindle control, the Gisholt Speed Selector, and many other automatic features, operating time and effort are reduced to a minimum. Ask for literature.

GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN

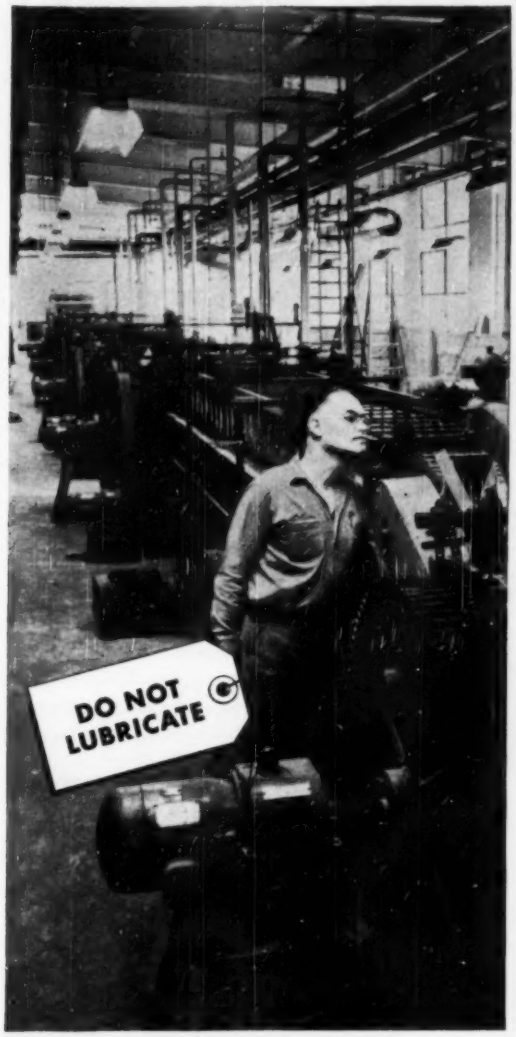
GISHOLT

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Life-Line SAVES

On your conveyors

The experience of this Philadelphia plant might well be yours. Maintenance costs of motors were moderate. Nevertheless, the plant operators were continually on the lookout for ways to cut costs. Sound familiar?

They found it in Life-Line motors. As they put it, "Life-Lines save the expense of constant lubrication. Formerly, it was necessary to have a special oiler do nothing but lubricate motors. Now, all this is eliminated. Life-Lines need no lubrication."

Unusual? No. Typical on Life-Line installations. Users all over the country say, "Life-Line motors save me money". An industry average indicates a yearly saving of $2.70 per motor from lubrication alone.

Think what it costs to lubricate motors on your conveyors and other equipment. That's money you can save . . . money you can deduct from your operating expense account.

Isn't this saving worth getting? You get it with Life-Lines at no extra cost. Ask your Westinghouse representative for a copy of Motor Costs, B-4321, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-21584

— — If you figure LIFE-COSTS . . . you'll figure LIFE-LINE — —

Westinghouse Life-Line Motors

INDUSTRY'S LEADING MOTOR

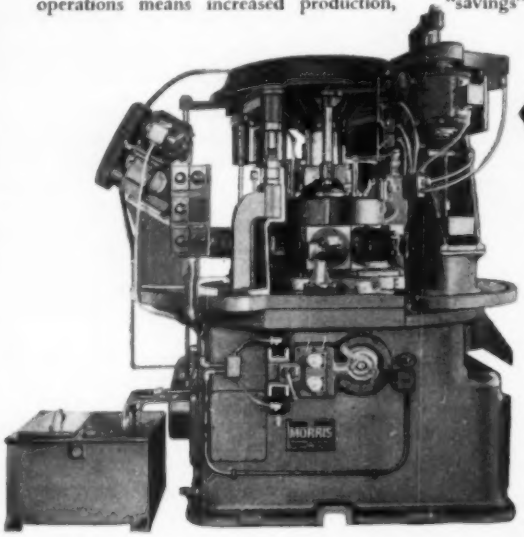
Proven answer to higher costs...

MORRIS *Mor-Speed* MACHINES

...for profitable production

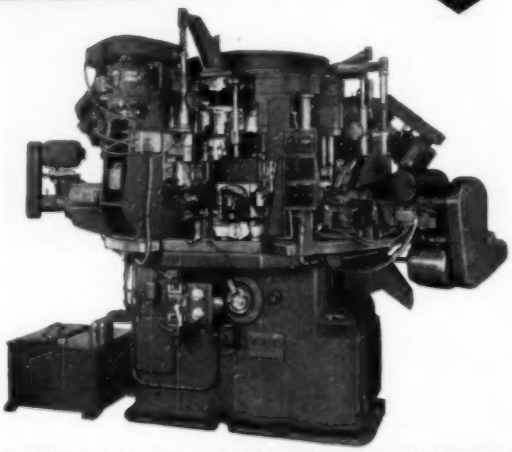
ALMOST any cost problem in today's manufacturing will yield to higher production . . . just as almost any series of machining operations on a single part can be consolidated on one or more MORRIS MOR-SPEED Production Machines. Eliminating handling between operations means increased production, with greater accuracy.

Shown here are a few examples of cost-cutting, production boosting MOR-SPEED Machines built for prominent manufacturers. Your own "problem" parts can be handled in a similar manner. Submit drawings for a prompt, no-cost, no-obligation "savings" estimate by Morris Engineers.

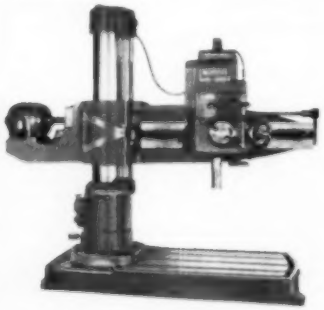


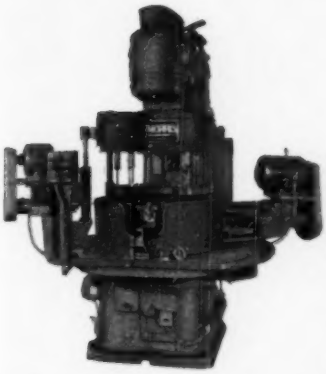
Six operations—drilling, reaming, facing, spot facing, chamfering and tapping—are done simultaneously on this MOR-SPEED machine. The operator merely loads and unloads carburetor air horns for continuous, automatic production.

Another mass production MOR-SPEED Machine for carburetor production. Twelve automatic indexing four-position fixtures carry the carburetor bodies through drilling, facing, tapping, brushing and reaming operations.

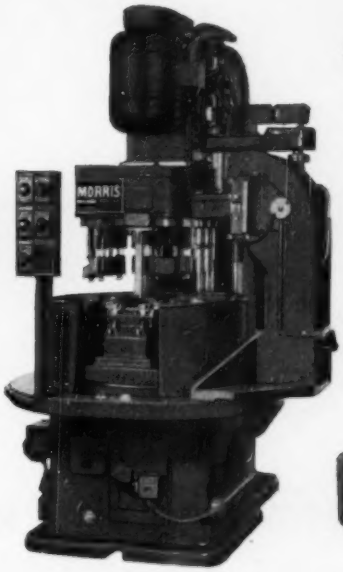


Morris also builds a line of 9", 11" and 13" Column Radial Drills with outstanding features which contribute to easy operation, sustained accuracy and long service life. Details on request.

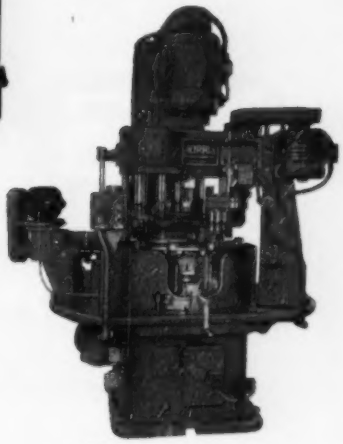




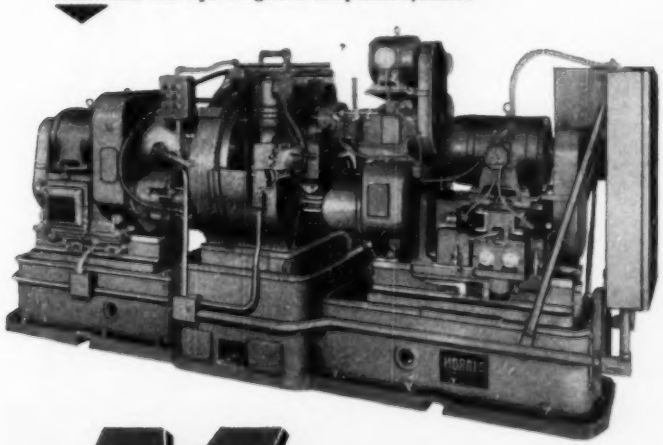
Automotive oil pumps roll off this Hydraulic 6 Station Automatic Indexing machine. Four vertical drill spindles, 2 vertical reaming spindles, 1 vertical counterboring spindle, 1 vertical spotfacing spindle and 3 horizontal drill spindles perform a multitude of operations.



Vertical Four Station Automatic Indexing Machine arranged to drill, ream and tap two 5/16-24 holes in universal joint races. Four, two-position automatic clamping fixtures permit operator to load and unload without interrupting high production rate.



This combination of two horizontal feed units, each with 15 spindles—a six station auto-indexing mechanism—and a three spindle tap head—drills, reams, countersinks and taps refrigerator compressor cylinders.



Each index of this 10 Station Vertical Hydraulic Automatic produces a finished auto oil pump housing. Drilling, reaming, chamfering and tapping are performed by 12 vertical drilling spindles, 2 vertical reaming spindles, 4 vertical tap spindles and 1 horizontal drill spindle.

THE MORRIS MACHINE TOOL COMPANY

"A better product at less cost— with MORRIS ENGINEERED PRODUCTION"

Builders of MOR-SPEED Line

933 HARRIET STREET CINCINNATI 3, OHIO

U.S. BERKEL

Quality Food Machines depend upon G.S. Gearing for Smooth, Accurate Adjustment

U. S. Slicing Machine Company has long been known for the fine engineering and precision craftsmanship employed in the manufacture of their products. Smooth operation of the gauge plate in their Model 805 Slicer is assured by a G.S. worm and shaft as well as the worm wheel assembly pictured here. Isn't it significant that wherever *really fine precision* is an essential requirement in Fractional Horsepower Gearing, that's where you'll usually find Gears by G.S? More and more of our country's largest and most discriminating manufacturers depend upon us for the production runs of the Small Gears they need. If you, too, want *better, more uniform, longer-lived* Gearing correctly designed and cut to exacting specifications, put *your* problems up to our competent engineers. Suggestions, ideas, and moderate cost estimates won't cost you one penny! Will you write us today?

SEND FOR *free G. S. catalog-bulletin, describing many different types and applications of our Fractional Horsepower Gears.*

FRACTIONAL HORSEPOWER GEARING

GS

GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

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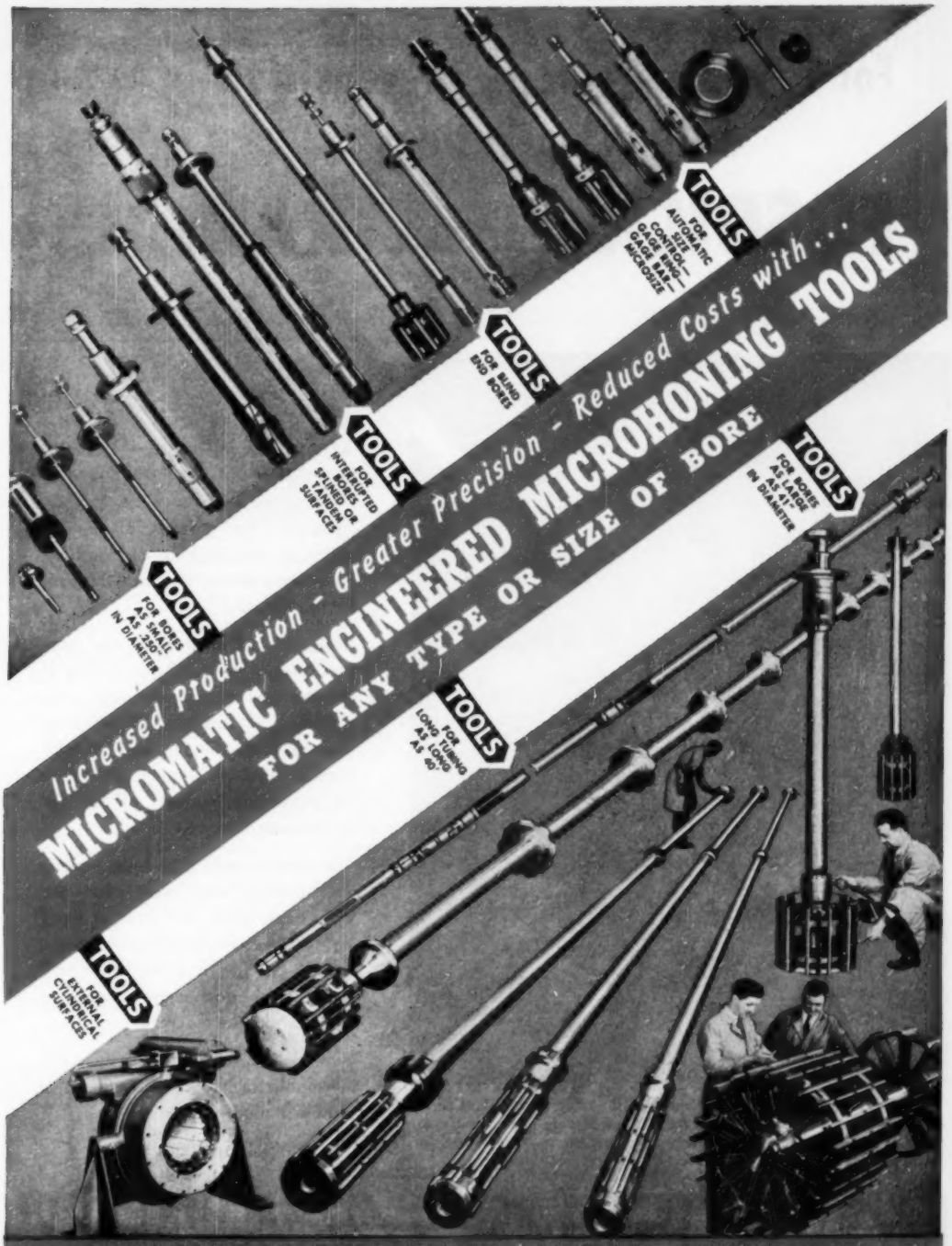
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS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MICROMATIC ENGINEERED MICROHONING TOOLS
FOR ANY TYPE OR SIZE OF BORE
TOOLS
FOR BORES AS SMALL AS .250" IN DIAMETER
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FOR INTERRUPTED BORES SPLINEDS OR TANDEM SURFACES
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TOOLS
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FOR TUBING LONG AS LONG AS 40'
TOOLS
FOR EXTERNAL CYLINDRICAL SURFACES

MICROMATIC HONE CORPORATION

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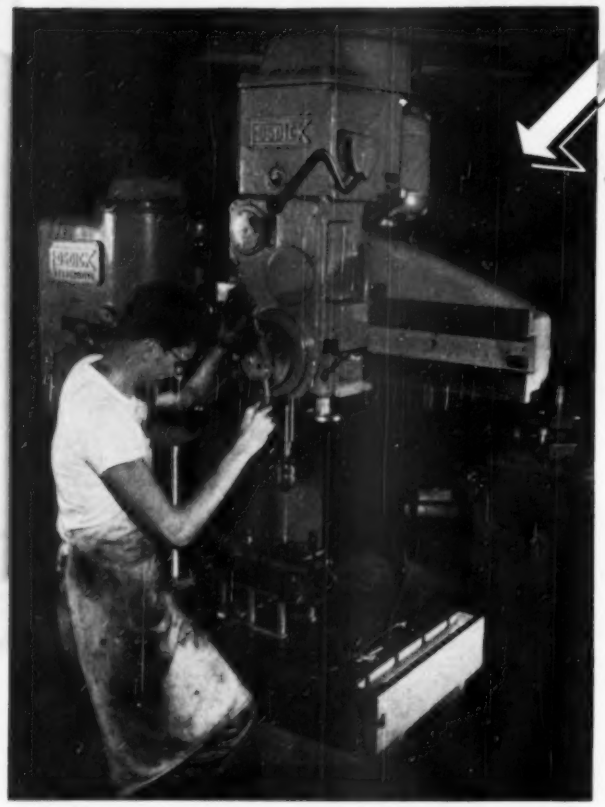
For a wide diversity of sensitive drilling operations

FOSDICK *Sensitive* RADIALS



The Fosdick Sensitive Radial illustrated is operating in the plant of the Reliable Electric Co. of Chicago, Illinois. This is only one of the many types of plants where Fosdick Sensitive Radials are meeting varied job requirements.

● Regardless of what type of an industrial plant uses a FOSDICK Sensitive RADIAL and whether it is working on a production job or "quickie" the general all-around utility of the machine on sensitive operations makes it a valuable asset to any shop.

Designed and built along the general lines of a Radial except that it has the arm at a fixed height plus an adjustable table which slides up and down the column, the FOSDICK Sensitive RADIAL is meeting a steadily increasing number of job requirements.

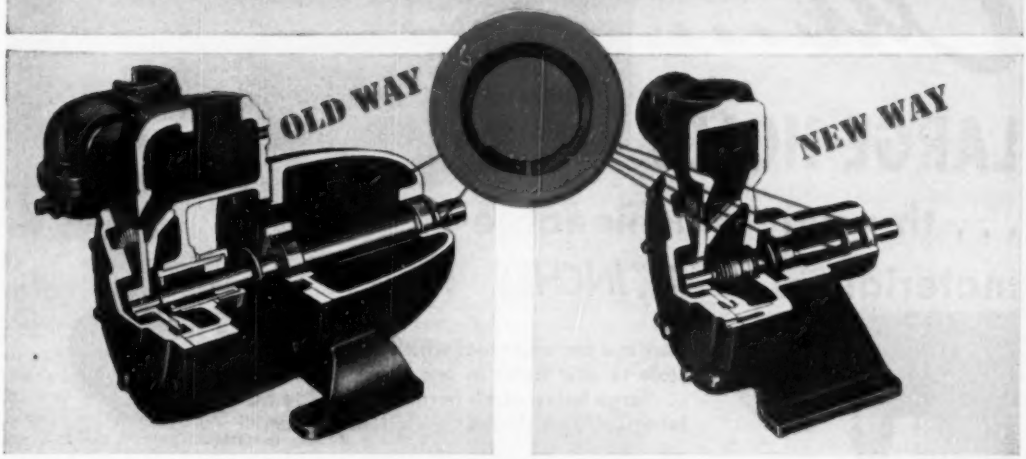
The nine speeds and four feeds—the standard base construction—the adjustable table and arm at fixed height, both of which swing in an arc of 360°, are construction features which add immeasurably to the utility of the machine.

Full details of this machine are available in the Fosdick Sensitive Radial Bulletin S.R.A.

Write for a copy today.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

REDESIGN TRIMS LENGTH 5¼ INCHES, CUTS UNIT COST $5.70



Series D Wayne water pump uses machined shoulders to position bearings on shaft. 2 Truarc rings hold bearings in housing. Locknut holds screw-type stuffing box that requires periodic tightening.

New design uses 4 Truarc Inverted rings (2 external, 2 internal) to position shaft, retain bearings. Inverted rings provide shoulders of uniform section height. 1 Standard ring secures maintenance-free mechanical seal.

Redesign with Truarc Rings helps save $5.70 per unit for Wayne Home Equipment Company, Inc., Fort Wayne, Ind. It gives them a more compact product, eliminates a separate bearing pedestal and a skilled-labor grinding operation. It facilitates use of maintenance-free mechanical seal instead of old type stuffing box.

Redesign with Truarc Rings and you too will cut costs. Wherever you use machined shoulders, nuts, bolts, snap rings, cotter pins, there's a Truarc Ring that does a better job of holding parts together.

Truarc Rings are precision engineered. Quick and easy to assemble, disassemble. Always circular to give a never-failing grip. They can be used over and over again.

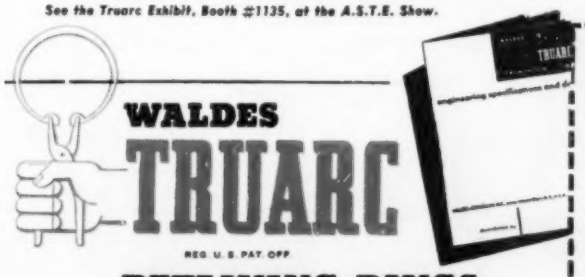
Find out what Truarc Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

See the Truarc Exhibit, Booth #1135, at the A.S.T.E. Show.

REDESIGN WITH 5 TRUARC RINGS GIVES THESE BIG SAVINGS

- *Cuts length 5¼ inches*
- *Cuts total labor 15.3%*
- *Eliminates skilled-labor grinding operation*
- *Saves 38.3% materials*
- *Allows use of stock-size shaft, smaller bearings*
- *Eliminates separate bearing pedestal*

TOTAL UNIT SAVING . . . $5.70



WALDES TRUARC

REG. U. S. PAT. OFF

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS ARE PROTECTED BY U. S. PATS. 2,302,048; 2,005,454; 2,410,802 AND OTHER PATS. PEND.

Waldes Kohinoor, Inc., 47-16 Austel Place AM-042
Long Island City 1, N. Y.

Please send 28-page Data Book on Waldes Truarc Retaining Rings.

Name_____

Title_____

Company_____

Business Address_____

City_____ Zone_____ State_____ ★

Cut...

LARGE HOLES

. . . thru any machineable material up to $1\frac{1}{8}$ *INCHES* thick!

Here is a premium tool which makes it possible to saw holes in one short operation . . . large holes which heretofore had to be laboriously machined "a-chip-at-a-time."

MARVEL High-Speed-Edge Hole Saws have strength to withstand the terrific peripheral strains of heavy duty operation in lathes, drill presses or portable power tools. They have a high speed steel cutting edge which is electrically welded to a tough, alloy steel body, high speed steel pilot drills, heavy hexagonal shanked arbors and sufficient set for deep drilling. They are self-aligning, as the larger diameter saws float on their arbors and are driven by double drive pins. They will saw round holes accurately in any machineable material.

MARVEL High Speed-Edge Hole Saws come in 35 sizes, from $\frac{5}{8}$" to $4\frac{1}{2}$". They are carried in stock by leading industrial distributors.

WRITE FOR BULLETIN ST-49

"MARVEL" *has Always had the edge!*

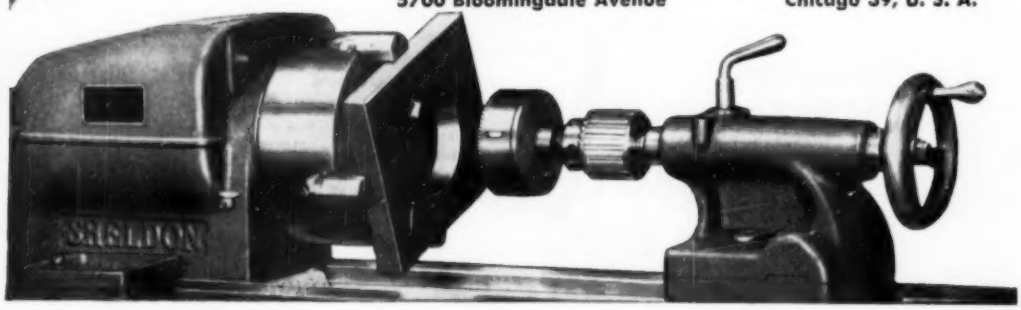
MARVEL *Metal Cutting* **SAWS**

Better Machines Better Blades

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Avenue **Chicago 39, U. S. A.**



Are you missing this cost saving?

SOME OF *YOUR* COMPETITORS ARE USING Lusol

AND GETTING UP TO 400% GREATER MACHINE SPEEDS AND USING LESS TOOLS AND IMPROVING THEIR EMPLOYEE RELATIONS

10 million gallons of Lusol solution used in exhaustive testing and practical plant applications, have proved, and in important places, that Lusol as a coolant completely revolutionizes thinking on machine speeds, tool life, and production costs.

BASED ON A NEW CONCEPT

Lusol depends upon cooling rather than lubrication at the point of tool contact. Lusol makes possible up to 300% to 400% greater speeds, less tool wear, less tool breakage, finer finish and lower cost production.

LUSOL IS GOOD EMPLOYEE RELATIONS

Operators like Lusol because it is a clear, clean solution, like a mild soap. Those who work with their hands in old type coolants all day long have often suffered from skin eruptions. Lusol does not cause skin irritations. Clothes and shoes are kept cleaner — the machines are clean, the work is clean, the shop is clean. This clear solution allows the operator to see the work as the finest drill comes down to the work piece, perfect vision, less operator fatigue. Lusol means longer tool life, fewer tool changes, less wheel dressing; easier, faster, smoother production without increased effort. Of course, operators like it, and we've never found one yet who would be willing to go back to the "old way."

BROACHING

275% greater production per broach grind

COLONIAL VERTICAL BROACH
Metal: No. 3140 Steel Forging
Operation: Broach Tank Track Cap
Ordinary Cutting Oil: 2400 pieces per broach grind
Lusol: 9000 pieces per broach grind

GRINDING OPERATIONS

23 more pieces per wheel dressing

MATTISON SURFACE GRINDER
Metal: No. 3140 Steel
Operation: Finish grind .02" from chuck jaw
Ordinary Soluble Oil: Wheel dressing every 7 pieces
Lusol: Wheel dressing every 30 pieces

DRILLING AND TAPPING

Saved 165 drills

MORRIS SPECIAL ROTARY DRILL
Metal: SAE 1035 Steel Forging
Operation: Drill 2 11/16" holes in connecting rod cap
Ordinary Cutting Oil: Replaced 170 drills per week
Lusol: Replaced 5 drills per week

MORE EVIDENCE

MACHINING

Machining a No. 347 Stainless Steel forging on a Warner-Swasey 3A Lathe, with soluble oil, required three tools to make cut 2-5/16" deep, and change of shovel nose tool after each piece. Now, using Lusol 40-1, the deep cut is made with one tool, and six pieces are produced per shovel nose tool. Savings are obvious, since twenty-five minutes idle time is required for each complete tool change.

MILLING

A Cincinnati Miller removed ½" stock from two sides and cut a groove 2" x 1¾" down the center of one side of a long bar of NE 8749 steel. With soluble oil 20-1, four pieces per cutter grind were produced, with heavy smoking. After changing to Lusol 40-1, nine pieces are produced without smoke before regrinding of tools.

BORING

Tools used on a Warner-Swasey 2A to bore and face a cluster gear forging required regrinding every four hours when cooled with a soluble oil. With change to Lusol 40-1, tool life is increased to sixteen hours, machine runs at maximum speed, production increased.

→ → BOOTH 422 A.S.T.E. EXPOSITION

CASE HISTORIES YOU CAN'T AFFORD TO OVERLOOK ↓↓↓

Lusol

SAVES TOOLS ▼ SPEEDS WORK
CUTS COST

NATIONAL DISTRIBUTION . . . WAREHOUSE STOCKS

F. E. ANDERSON OIL COMPANY
222 Brownstone Ave., Portland, Conn.

Please send me your case history material on:
☐ Broaching ☐ Drilling, Tapping ☐ Grinding

Name

Company

Address

1AN50

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

Stocked by Leading Tool Departments

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U.S.A.

New York and San Francisco

Write for New S-48 Catalog just released.

General Purpose Lathes made in 12" 16" and 20" sizes.

SEE YOUR *Sebastian* DISTRIBUTOR

for complete information on this value-leading, medium-priced lathe

Your Sebastian Distributor can show you why the Sebastian Lathe, with a powerful 8-speed geared head . . . Timken bearings on all headstock shafts . . . reverse in apron for feeds . . . 57 feed and thread changes . . . and many more modern design and construction features, represents today's outstanding buy in the medium-price lathe field. Ask your Distributor or write us for Catalog S-1 (Standard Lathes) and S-101 (Special Type Lathes—Gap, Clutch and Brake, etc.).

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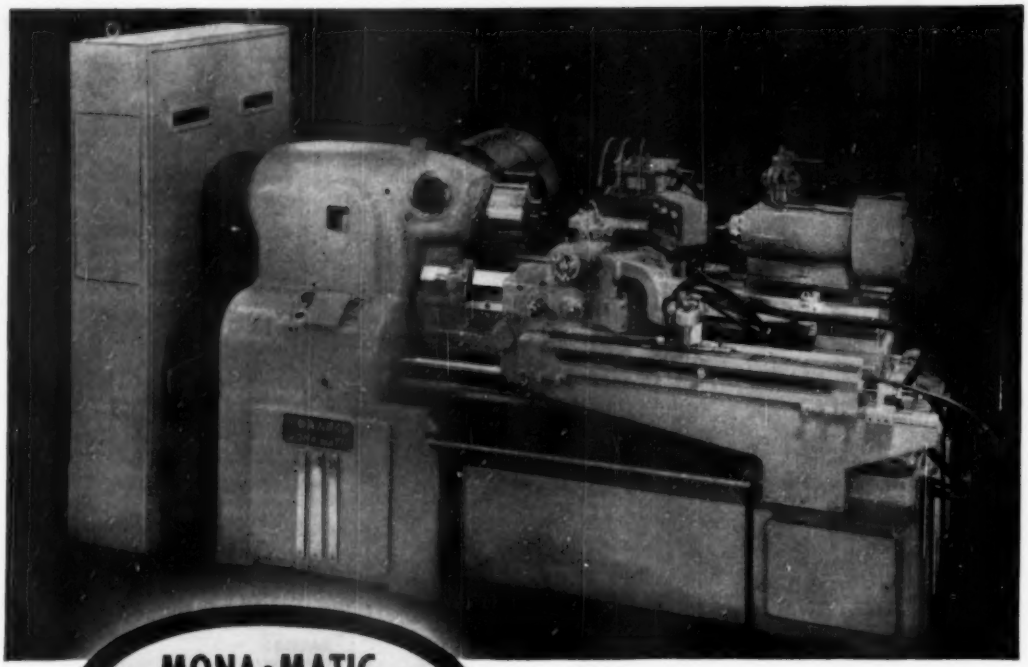
KING MACHINE TOOL DIVISION

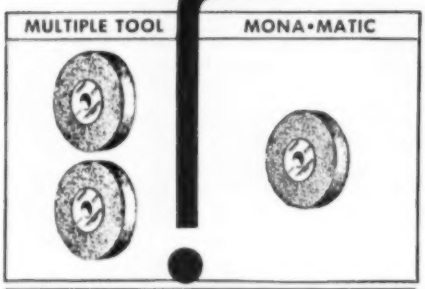
CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes



MONA•MATIC or Multiple Tooling Methods ..WHICH?

LET'S TALK ACCURACY!



	Multiple Tool Automatics (Battery of Four)	Mona-Matics (Battery of Two)
Production	120/hour	160/hour
Cutting Tools	Cemented Carbide	Cemented Carbide
No. of Tools	40	4
Cost of Tools (including one replacement set)	$4220	$187
Setup Time	28-30 hours	46 minutes
Total Horsepower	80-120	40
Floor Space	150-200% more than Mona-Matics	
Subsequent Grinding Operations		50% less time than multiple tool

Would you like to cut your grinding time in half? It's just as simple as that.

On the typical steering knuckle job detailed at the left, the increased accuracy of the Mona-Matic method reduces the time for subsequent grinding operations to 50% of that required by the former multiple tool automatic method. Stepless single point Air-Gage Tracing is inherently accurate—and easier to *keep* at maximum accuracy as normal tool wear necessitates adjustments.

But bear in mind that reduced grinding is not the whole story of the Mona-Matic's outstanding ability to cut your costs. You'll save on production time, on tooling costs, on setup time, on power consumption and on floor space, too. For the full facts on how Monarch's famous Mona-Matics will outperform any ordinary multiple tool machining method, write for Bulletin 1804.

COMPARATIVE CASE STUDY

Part—Steering Knuckle,
SAE 1045, turned section—5⅜" long, ¾" to 3" diameter

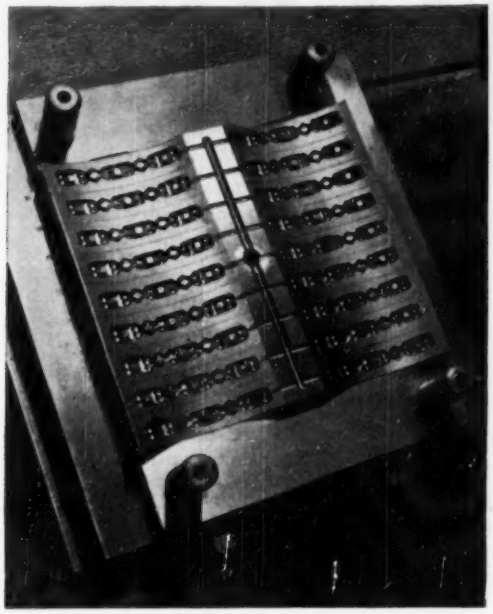
ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

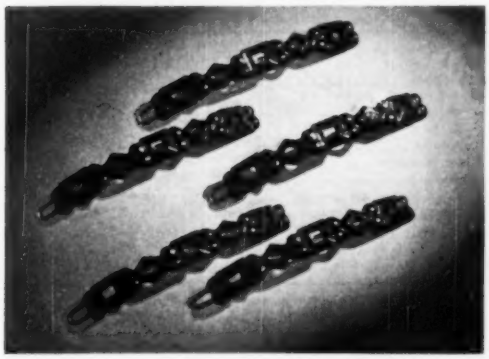
THE MONARCH MACHINE TOOL CO. Sidney, Ohio

DURAMOLD A

Air-Hardening Hobbing Steel for Mold Cavities



Hobbed from Duramold A in one push, this mold is a fine example of the intricate detail which can be attained in hobbing. The square and diamond-shaped "core pins" were raised up in the mold by the pressure of the master hob. Movement in heat-treatment was held to a minimum.



The highly polished surfaces of the mold made possible a high-quality finish on these injection-molded plastic barrettes. Mold made by Banner Mold & Die Co., Inc., Leominster, Mass. Plastic molding by E. B. Kingman Co., Leominster, Mass.

Duramold A has outstanding advantages for mold cavities used in the plastics industry. It's easy to hob . . . and its 5 pct chromium content provides high wear-resistance and core strength. Distortion in hardening is minimized by its air-hardening characteristics.

Duramold A has the balanced alloy content that meets today's requirements for a hobbing steel with high mechanical properties. Here are the facts:

High Wear-Resistance. Duramold A is suitable for long runs because of its alloy content and high surface-hardness after carburizing (Rockwell C—61 to 63).

Holds Close Dimensions. Air-hardening greatly reduces distortion in hardening, making Duramold A suitable for intricate cavities, thin sections.

Easy to Hob. It anneals to less than 109 Brinell and hobs deeper than the nickel-chromium steels. It does not work-harden rapidly.

Takes High Polish. Duramold A is scrupulously inspected to assure a clean, sound structure. The 5 pct chromium content provides improved corrosion-resistance, as compared with ordinary hobbing steels.

For High Temperatures and Pressures. It is suitable for operating temperatures up to 650 F. Its high core strength permits high pressures.

High Surface Hardness. An air-cool, following carburizing at 1700 F and a 300 to 400 F temper, results in a surface hardness of Rockwell C—61 to 63. Core hardnesses are in the range of Rockwell C—30.

For Machined Cavities. When Duramold A is used for a machined cavity, it is annealed at 1600 F to obtain a Brinell hardness of 170 . . . which machines easily.

Typical Analysis	C	Mn	Si	Cr	Mo
	0.07 max	0.40	0.20	4.50	0.45

The nearest Bethlehem sales office or tool-steel distributor will gladly tell you about this hobbing steel and other Bethlehem Tool Steels for both hobbed and machined cavity molds. Write today for our new booklet, "Tool Steels for the Plastics Industry."

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
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BETHLEHEM STEEL

Bethlehem SUPERSONIC TESTED **Tool Steel**

REED-PRENTICE
12-V MILLER with ELECTRONIC DUPLICATOR

CUTS
DIE SINKING COST!

Reed-Prentice 12-V Universal Head Vertical Miller with electronic Duplicator attachment.

because...

1. Accurate duplication of work can be maintained to tolerance of ±.001.

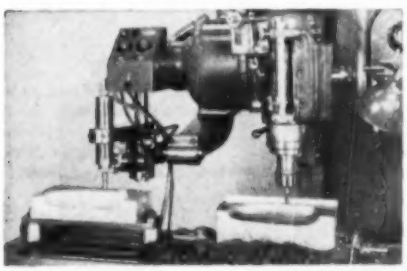
2. Table feed reduces automatically when cutter approaches steep side.

3. Conveniently located duplicator control panel allows cutter to be withdrawn and re-engaged quickly without overtravel.

4. Interlocking duplicator and feed circuit stops table immediately if duplicator stops.

in addition...

The all purpose 12-V with Universal Head is a high speed milling and boring machine ideal for many toolroom jobs. Universal head adjustment and sliding ram combined with infinitely variable feed and speed controls offer complete versatility.



△ Electronic duplicator attachment machining automobile arm rest mold.

SPECIFICATIONS

CAPACITY	
Max. distance Table to face of spindle	18"
Max. distance Spindle to column	26"
Min. distance Spindle to column	12"
HEAD	
Infinite speeds	90 to 2200
# 40 NMTBA taper in spindle	
Head swivels (F & B)	45°
(L & R)	30°
Vertical Travel of spindle	5"
RANGE	
Longitudinal travel	28"
Cross Travel	12"
Vertical Travel	14"
Size:	
Working surface	12" x 46"
3 T-Slots (spaced 3")	11/16"
FEEDS: Inches per Min.	
Longitudinal	½" to 24"
Cross	½" to 24"
Vertical of ram	5/32" to 16"
SPINDLE DRIVE MOTOR	3 HP

WRITE FOR DESCRIPTIVE FOLDER TO DEPT. A

MACHINE TOOLS

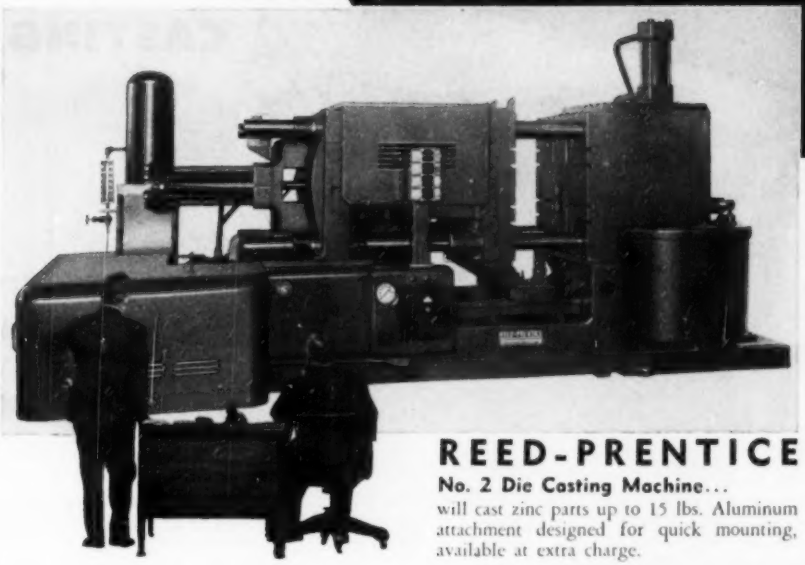
REED-PRENTICE CORP.

WORCESTER MASS., U.S.A.

MAIN OFFICE:
WORCESTER 4, MASS.

BRANCHES:
NEW YORK 6, 75 West Street
CLEVELAND 13, 1213 W. 3rd Street
LOS ANGELES 58, 2314 Santa Fe Ave.

Cost Conscious Manufacturers are looking to ... DIE-CASTING!



REED-PRENTICE

No. 2 Die Casting Machine...
will cast zinc parts up to 15 lbs. Aluminum attachment designed for quick mounting, available at extra charge.

When redesigning or planning new part specifications — with an eye toward lower production costs — it will pay you to consider die casting. Substantial savings are being realized by many leading manufacturers who are using Reed-Prentice die casting machines to produce strong, lightweight parts.

From the complete Reed-Prentice line, you will find an efficient machine for every die casting purpose within the range of 1 to 15 lbs. on zinc and 2 to 7 lbs. on aluminum. Interchangeable zinc and aluminum attachments are available for all models.

Write Dept. A for descriptive circulars on models of interest to you.

SPECIFICATIONS	#0	#1	#1G	#1½	#1½G	#2	#2G
Size of die plates	10 x 10"	16 x 21"	16 x 21"	28 x 29"	28 x 29"	38 x 36"	38 x 36"
Diameter of tie bars	1½"	3"	3"	3"	3"	4"	4"
Space between bars	8¼"	12"	12"	15 x 18"	15 x 18"	24 x 24"	24 x 24"
Die opens	4"	8"	8"	10"	10"	14"	14"
Maximum die space	4"	14"	14"	22"	22"	30"	30"
Capacity per shot (Lbs.)	1-zinc	5¼"-zinc	2.35 alum	10½-zinc	3¾-alum	15-zinc	7-alum
Net weight (Lbs.)	1,500	8,000	7,200	15,000	13,000	18,000	15,000

DIE CASTING
REED-PRENTICE CORP.
WORCESTER MACHINES MASS., U.S.A.

MAIN OFFICE:
WORCESTER 4, MASS.

BRANCHES:
NEW YORK 6
75 West Street
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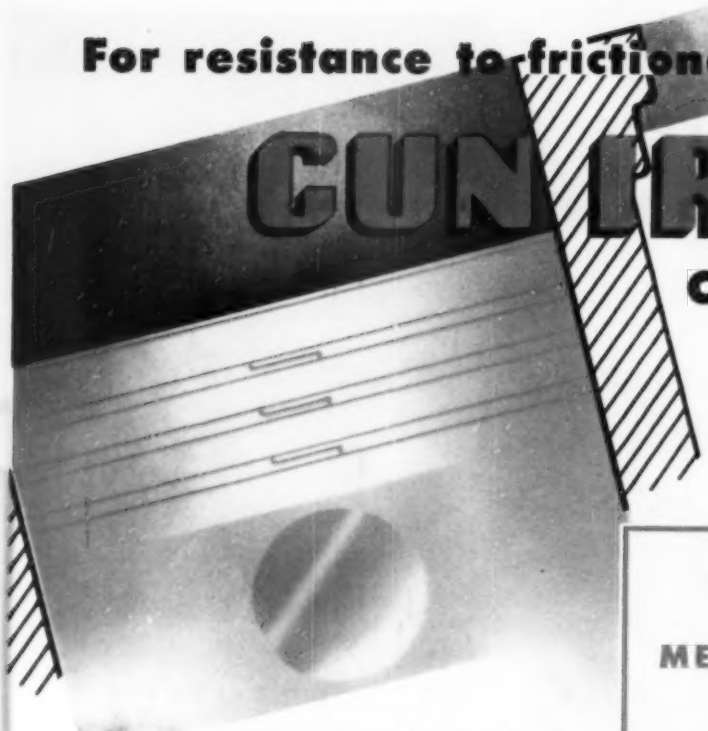
For resistance to frictional wear...

GUN IRON CASTINGS



If there are cast wearing parts in your products or equipment, it will pay you to investigate the advantages of Gun Iron. Since its original development over 139 years ago, Gun Iron and its alloys have proved superior for wear resistance on literally thousands of different applications.

Taking one industry as an example, Gun Iron is used for steam locomotive cylinder and valve packing rings and bushings, crosshead shoes and rod bushings to name a few. On all of these, friction is extremely severe due to irregular lubrication. Because of the exceptional performance of Gun Iron, it is specified for these parts by most leading engine manufacturers and railroads.

Gun Iron is produced in air furnaces similar to steel open hearth furnaces and has a dense, close-grained, 100% pearlite microstructure with an even distribution of flake graphite throughout. It also has exceptional resistance to high heat, impact, corrosion and erosion and damps vibration more effectively than other irons. Our engineers and metallurgists are at your disposal to discuss the application of Gun Iron to your strategic cast parts . . . our furnaces, foundry and extensive machining facilities stand ready to produce them accurately and economically. Why not write for more details today?

GUN IRON *in the* METALWORKING INDUSTRY

Hunt-Spiller casts and machines parts for a wide variety of applications in metalworking. A few are shown below:

DIES • MACHINE TOOL CASTINGS • SURFACE PLATES • WEARING PARTS FOR PUMPS, COMPRESSORS, ENGINES, ETC. • H-S THREE PIECE RINGS • PRESSURE CASTINGS

Chances are that there are many other places where Gun Iron can solve a design or operating problem. To help you determine the value of Gun Iron for your cast parts, our metallurgical department has prepared a comprehensive bulletin which contains complete properties and discussions of Gun Iron and many other metals. Engineers claim it an invaluable reference aid. Send for your free copy today.

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395 DORCHESTER AVENUE • SOUTH BOSTON 27, MASS.

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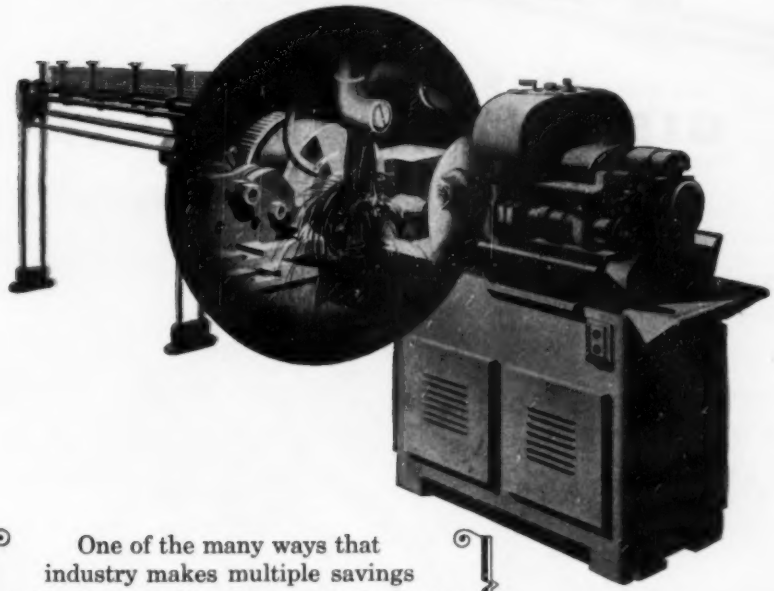
GULF CUT-AID

helps cut machining costs for aluminum and other non-ferrous metals— improves finish, tool life



One of the many ways that industry makes multiple savings with Gulf Quality Petroleum Products.

Economical machining of aluminum and other non-ferrous metals requires a cutting oil with special properties. It must have unusually good cooling and wetting characteristics, yet have better lubricating qualities than water or soluble oil emulsions.

Hundreds of machine shops have found that Gulf Cut-Aid is the ideal fluid for this type of machining job. This revolutionary cutting oil helps them get better finishes on the work, longer tool life, and greater production.

Here's a report, for example, from a New York firm who had a problem in drilling a hole 2 in. deep in brass bolts: "Competitive oils wouldn't penetrate into the hole during the drilling operation", says the Machine Shop Foreman. "As a result, tool life was unsatisfactory. Now with Gulf Cut-Aid we drill a thousand pieces before regrinding, an increase of more than 100%! Also because of the exceptional cooling qualities of Gulf Cut-Aid we have no difficulty in holding tolerances to specifications."

Gulf Cut-Aid is one of more than 400 Gulf quality oils and greases that are helping industry improve production and reduce costs. For effective assistance on every application of petroleum products in your plant, call in a Gulf Lubrication Engineer. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company

GULF BUILDING, PITTSBURGH, PA.

Sales Offices - Warehouses

Located in principal cities and towns throughout Gulf's marketing territory

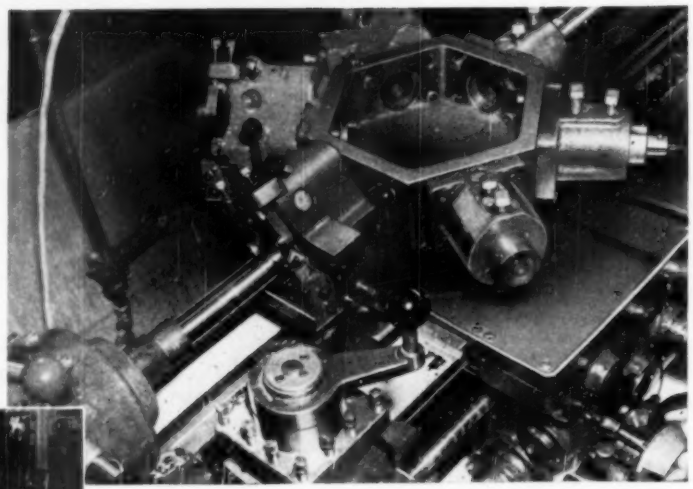
GULF INDUSTRIAL LUBRICATION

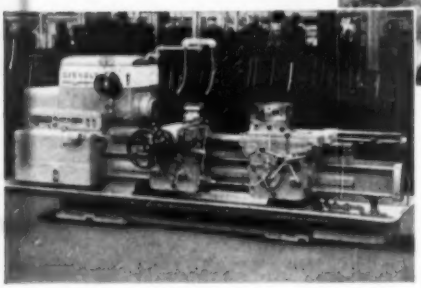
Helps make machines produce more at lower cost

take shaft jobs Like This:

they take less time on GISHOLT TURRET LATHES

Yes, even in lots as small as 5 or 10 parts, you can't beat turret lathes on this kind of work. Parts are machined complete in 2 operations—total time is less than 4 min.





THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

no extra equipment needed!

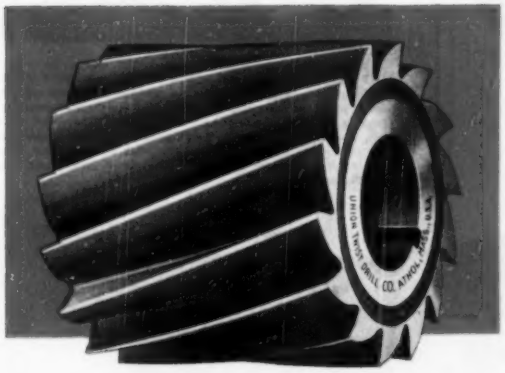
With no more than your standard bar equipment, you're all set to cut machining costs on shafts like these. No previous operations . . . such as cutting to length or centering . . . are necessary. And with *two or more tools* from turret and side carriage, you have the basic advantage of turret lathe economy—the time saving that means lower costs.

Before you turn to extra equipment or special attachments, look into the possibilities of doing the job the quick and easy way on Gisholt Turret Lathes. Gisholt engineers will gladly help you.

GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

You get minimum downtime, maximum work from UNION *milling cutters*



UNDERCUT TEETH with a special spiral angle give unusual efficiency to Union plain milling cutters. These teeth afford maximum strength, ample chip clearance in the fillet and permit resharpening without rapid increase in the width of land.

TWO BIG BENEFITS you can count on when you use Union Milling Cutters: less time lost, more work done.

These performance-proved cutting tools tackle the toughest jobs in the shop . . . day in, day out . . . with a minimum downtime for reconditioning. ***They cut costs as well as metal.*** Union cutters work to closest tolerances . . . get outstanding results from older machines as well as the latest equipment.

If you are not already using Union tools, see your nearby Union distributor. He will be glad to work with you on any milling problem. You'll find his name in THOMAS' REGISTER on Union's insert in the "Drills, Twist" section.

A CUTTER FOR EVERY JOB

Whether you need special cutters built to your specifications or can use the standard Union cutters, there's a Union milling cutter to meet your needs. Following is a partial list —

Plain Milling Cutters	Keyseat Cutters
Helical Milling Cutters	End Mills
Metal Slitting Saws	Concave Cutters
Screw Slotting Cutters	Convex Cutters
Slitting Shears	Inserted Blade Cutters
Side Milling Cutters	Form Cutters

no other milling cutter will outperform a UNION

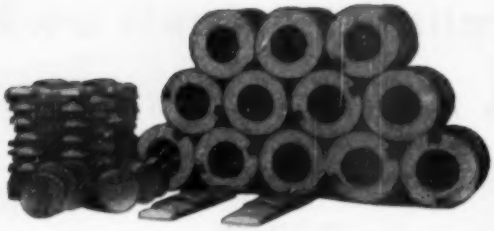
contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under the heading, "Drills, Twist".

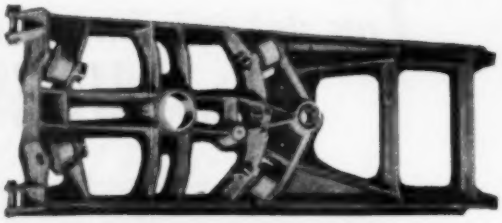
UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Milling Cutters · Gear Cutters · Twist Drills · Hobs · Reamers · Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

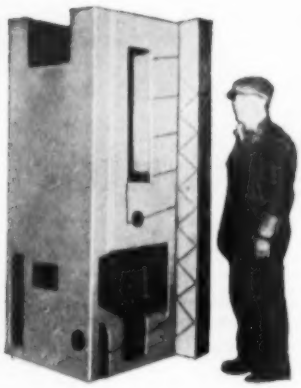


Rolling Mill . . . Screw-down Nuts — Ampco alloys are selected for their high resistance to terrific pressures and impact. Rolling mill pressures are transferred through the screw to the nut threads. In cases such as a blooming mill, this pressure is applied with impact — increasing from zero to several million pounds in a fraction of a second. That's why they need the tough strength of centrifugally cast Ampco aluminum bronze.

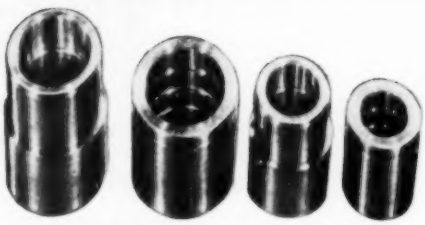


Earth-moving Equipment . . . Excavator Roller Bushings — Ampco Grade 18 selected for unusual wear resistance, excellent bearing qualities and high load-bearing strength. Turntable roller bushings must carry the tremendous weight of the cab, boom, and load. The turning is slow but eccentric because of the cantilever action of the boom and load. Ampco bronze alloys also used for gears, plates, cams, sleeves, and many other important excavator parts.

Garden Tractors . . . Worm Gears — Ampcoloy E-123 aluminum bronze selected for high strength and wear resistance, high impact and fatigue values. Reduced replacements to a mere 1/10 of the previous average. This outstanding saving is typical, accounts for the specification of Ampco aluminum bronzes for a wide variety of gears—from tiny fishing-reel gears to giant 1-ton gears for rolling mills.



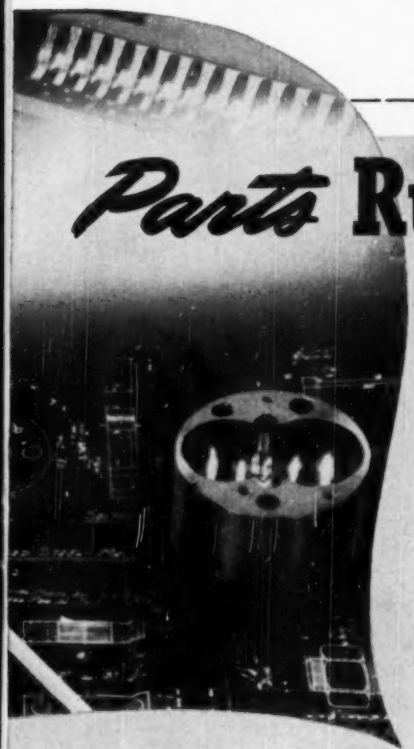
Forging Machinery Upsetter Slides — Ampco Grades 18 and 20 selected by one manufacturer to replace hardened steel because they combine excellent bearing qualities with the necessary strength to withstand a 40,000 psi load. In two and a half years of service they showed little signs of wear. The same high physical properties make these alloys ideally suited for such applications as wear strips and wear plates.



Die Sets . . . Guide Pin Bushings — Ampco Grade 18 selected for its hardness and excellent bearing qualities. Seizing and galling are eliminated. Exceptional resistance to wear maintains tolerances. Correct alignment is assured regardless of speed of travel. Tests by one concern show Ampco guide pin bushings give 2½ times the life of previous material. Standard bushings are centrifugally-cast from Grade 18 Ampco Metal.

Machine Tools . . . Many Vital Parts — Over sixty leading tool manufacturers recognize the advantages of Ampco over ordinary bronzes. They specify Ampco because it assures long life through resistance to wear. Ampco Metal is also well known for its versatility, its hardness, its uniform quality, high impact strength, high yield strength and high compressive strength.

Ampco Extrusions . . . Rod, barstock, tubes . . . shapes — Produced in Ampco's own extrusion mill with a modern 2275-ton hydraulic press and complete processing equipment. Economical to use — saves metal and machining time and cost. Ampco extruded products have superior grain structure and exceptionally high strength values, *plus* close tolerances and good surface finish.



AMPCO®

Parts Run Longer, Cost Less in the Long Run

. . . because Ampco aluminum bronze alloys give you this unique combination of cost-saving physical properties:

1. High tensile strength
2. High compressive strength
3. High impact and fatigue values
4. Excellent bearing qualities
5. High "strength to weight" ratio
6. Resistance to wear and/or corrosion
7. Little affected by extreme temperatures

Long-wearing Ampco bronze alloys give you longer and better service — reduce down-time losses — and cut maintenance and replacement to a money-saving low.

That's why it pays to use Ampco bronzes wherever you can. First, specify Ampco for critical parts in your own product — its longer service life is an added sales feature. Second, use Ampco bronze replacements in plant maintenance — its longer service life cuts down-time and servicing frequency. And don't forget to look for Ampco bronze parts in plant equipment you buy — it's your assurance of long life and trouble-free performance.

Everytime you specify an Ampco aluminum bronze, you can be sure it will do a better job—cost less in the long run. Send for complete information today.

Ampco aluminum bronze and other Ampco copper-base alloys are available in a variety of grades to meet your exact requirements in any form you need: rolled sheet or plate, sand or centrifugal castings, forgings or extrusions, and resistance-welding electrodes, corrosion-resistant centrifugal pumps and plug valves.

Free . . .

Money-saving information! Tear out this coupon and mail today.

AMPCO® **Ampco Metal, Inc.**

Milwaukee Wisconsin

West Coast Plant • Burbank, California

Ampco Metal, Inc., Dept. AM-4, Milwaukee 4, Wis.

Send me your free Ampco Metal Catalog giving full details of physical properties of the various grades of Ampco aluminum bronze alloys.

Name _____

Company _____

Company Address _____

City _____ ( ) State _____

Breaking Your Bottlenecks is Our Business

. . . in your Engineering Department . . . in your Toolroom . . . on your Production Line

That's Right! Taft-Peirce contract designing, tooling, and manufacturing services are tailor-made to solve *your manufacturing problems.* At your service are 400,000 square feet of plant . . . 1500 modern machine tools . . . 75 years of contract manufacturing experience . . . Ready to go to work for you . . . Now! Write for a copy of our 82 page contract service booklet, "Take It To Taft-Peirce." Address the Taft-Peirce Manufacturing Company, Woonsocket, R. I.

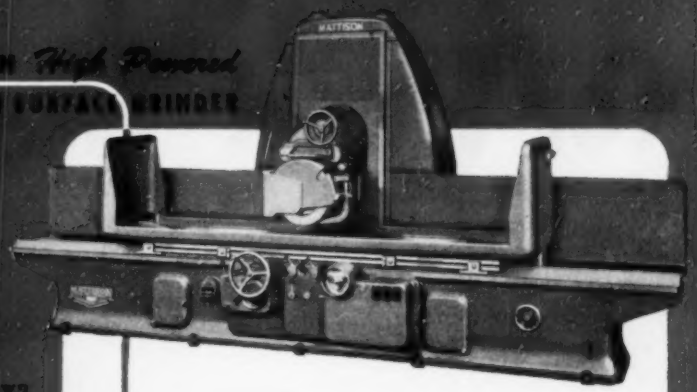
. . . for Engineering, Tooling, Contract Manufacturing

TAKE IT TO TAFT-PEIRCE

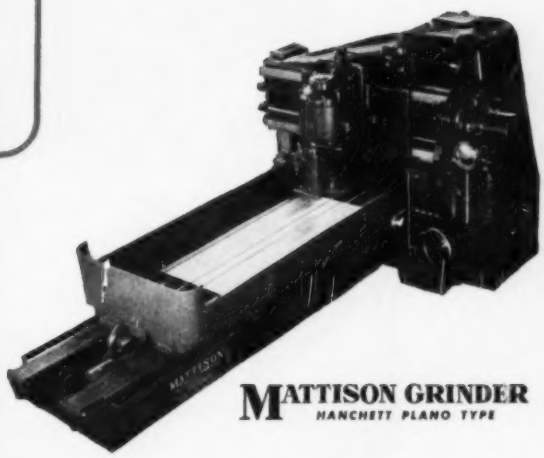
MATTISON GRINDERS

MATTISON *High Powered* PRECISION SURFACE GRINDER

● Mattison Machine Works, Rockford, Illinois has purchased the line of Production Grinding Machinery formerly made by the Hanchett Manufacturing Company of Big Rapids, Michigan. These machines will supplement the well-known line of Mattison High Powered Precision Surface Grinders and enables Mattison Machine Works to offer machines for handling practically all of your Surface Grinding problems on a low cost, high-production basis.



For further information on any of the Grinders listed, ask for free circulars containing complete specifications and operating data.



MATTISON GRINDER
HANCHETT PLANO TYPE

Grinders now built by MATTISON

SURFACE GRINDERS: High-Powered, Precision, Horizontal Spindle —Rotary Type, Vertical Spindle— Rotary Automatics, Vertical Spindle — Reciprocating Table Type, Vertical Spindle — Plano Type, Horizontal and Vertical Spindle.

FACE GRINDERS: Traveling Table (Hydraulic) and Traveling Wheel.

DISC GRINDERS: Single Spindle, Double Spindle, Vertical Spindle, Automatic Single Wheel.

WAY GRINDERS: Vertical Spindle for dovetails and undercuts.

ABRASIVE-BELT GRINDING AND POLISHING MACHINES for wide steel sheets, strip steel, internal tube, etc.

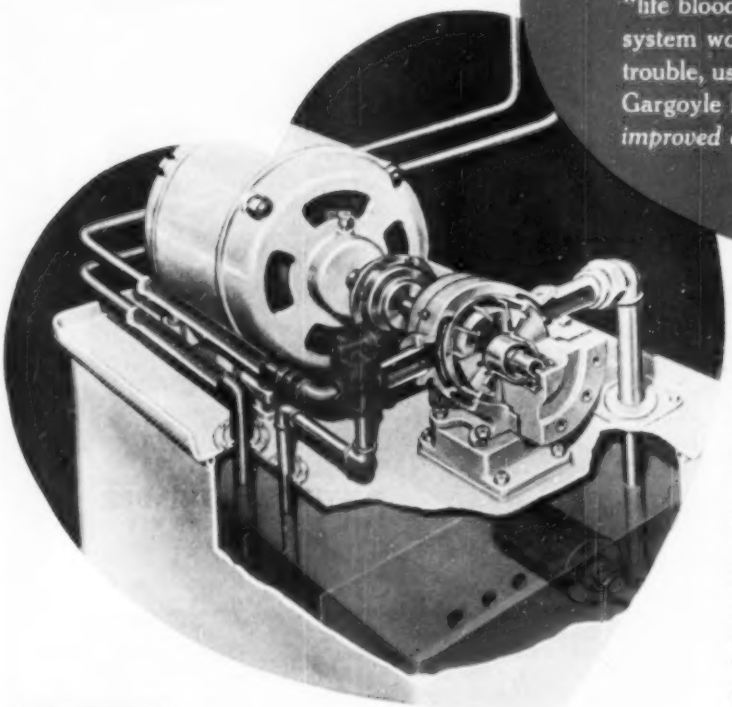
● For years Mattison Machine Works has successfully built High-Powered Precision Surface Grinders and will continue to build the same high quality into the entire line — through sound principles of engineering, precision manufacturing, careful workmanship and modern methods of production. Our reputation for service and careful attention to machines in the field will naturally extend over the complete line of Grinders now built by Mattison.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

Sure Cure for "Heart" Trouble!

THE WORLD'S GREATEST
LUBRICATION KNOWLEDGE AND
ENGINEERING SERVICE

"Heart" of many of your production machines is the hydraulic system... oil, the "life blood" that makes this system work. To avoid "heart" trouble, use world-famous Gargoyle DTE Oils—now *improved once again* to...



1. Lower your maintenance costs.
DTE Oils resist oxidation, help protect against rust, separate quickly from water. Result . . . greater freedom from deposits, longer life for pumps and valves, fewer shutdowns for cleanings.

2. Increase your production.
Because DTE Oils assure more perfect operation of hydraulic mechanisms, your machines run more continuously, produce more.

3. Lower your lubrication costs.
Improved chemical stability gives DTE Oils unusual resistance to deterioration, so they last longer, protect better, cost less in the long run.

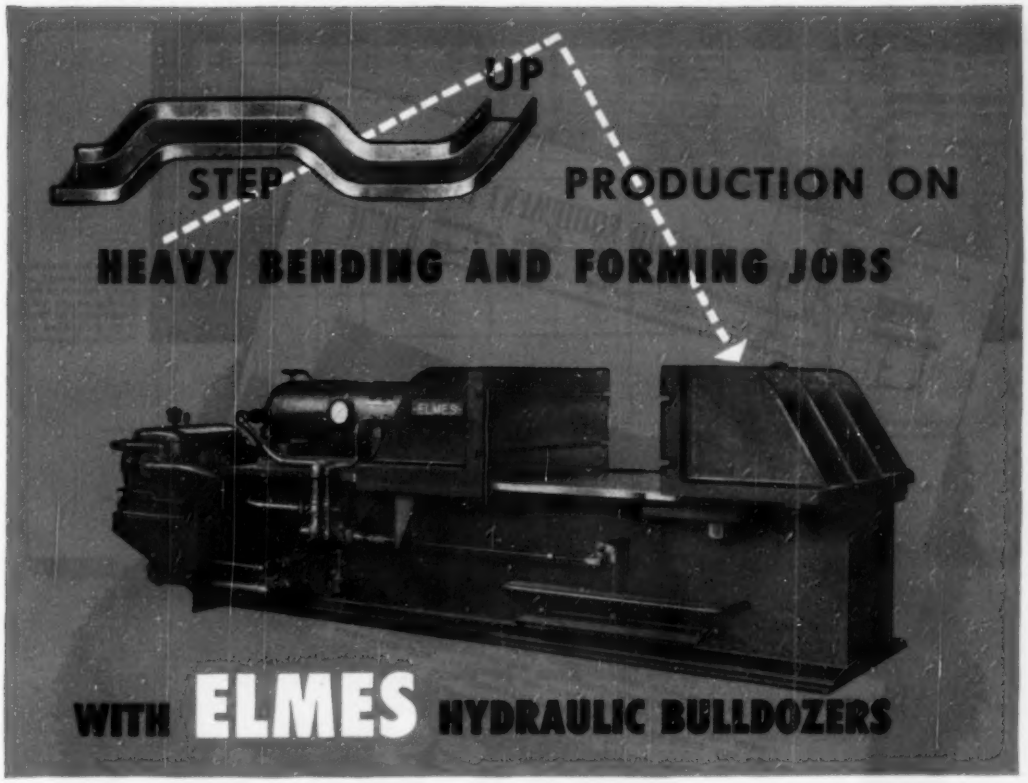
Get these great new oils for your hydraulic systems *now!*

SOCONY-VACUUM GARGOYLE Lubricants

Socony-Vacuum

Correct Lubrication

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION



Here is a highly *versatile* Elmes Hydraulic Press that will save you both *time* and *money* on heavy bending and forming operations. The controlled, cushioned squeeze of Elmes hydraulic power eliminates pre-setting or re-setting of press stroke for (1) job changes, (2) variations in stock size. To change jobs—just change dies! Full pressure can be applied at any point in the stroke and length of stroke can be varied to suit the individual job.

Elmes Hydraulic Bulldozers are available in both standard and special designs to meet any capacity requirement. Bed size, stroke and speed are optional to suit your service needs.

These presses have T-slots in platen and resistance head for mounting dies. Resistance head is adjustable for close-gap work. Other standard features are fixed stop reversal, extra-long removable guides on platen, sensitive tip-toe control, high-speed operation. Pumping unit is located on end of press, for protection against overhead traveling materials.

For nearly a century, Elmes hydraulic equipment has solved the pressing problems of industry. Why not ask Elmes to assist in the selection or design of the right metal-working press for *your* production? Recommendations and cost estimates are yours for the asking!

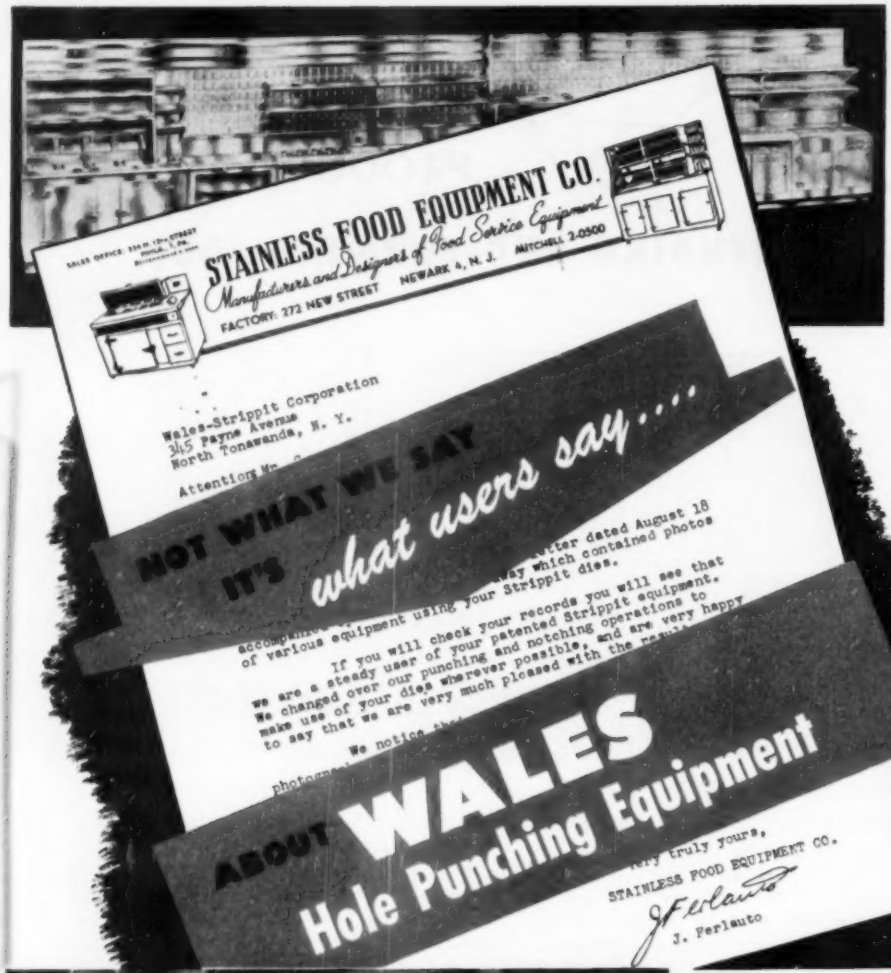
Write for Bulletin 1010-B, "Hydraulic Metal-Working Presses."

AMERICAN STEEL FOUNDRIES • ELMES ENGINEERING DIVISION

Distributors in Principal Industrial Centers — *Also Manufactured in Canada*

PLANT NEW ADDRESS — 1150 Tennessee Avenue CINCINNATI 29, OHIO

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES


STAINLESS FOOD EQUIPMENT CO.
Manufacturers and Designers of Food Service Equipment
FACTORY: 272 NEW STREET NEWARK 4, N. J. MITCHELL 2-0500
Wales-Strippit Corporation
345 Payne Avenue
North Tonawanda, N. Y.
Attention Mr.
NOT WHAT WE SAY
IT'S what users say....
If you will check your records you will see that
we are a steady user of your patented Strippit equipment.
We changed over our punching and notching operations to
make use of your dies wherever possible, and are very happy
to say that we are very much pleased with the
ABOUT WALES
Hole Punching Equipment
Very truly yours,
STAINLESS FOOD EQUIPMENT CO.
J. Ferlauto

Showing Stainless Food Equipment Company's standard Back Bar Equipment which is fabricated by Wales Hole Punching and Notching Equipment.

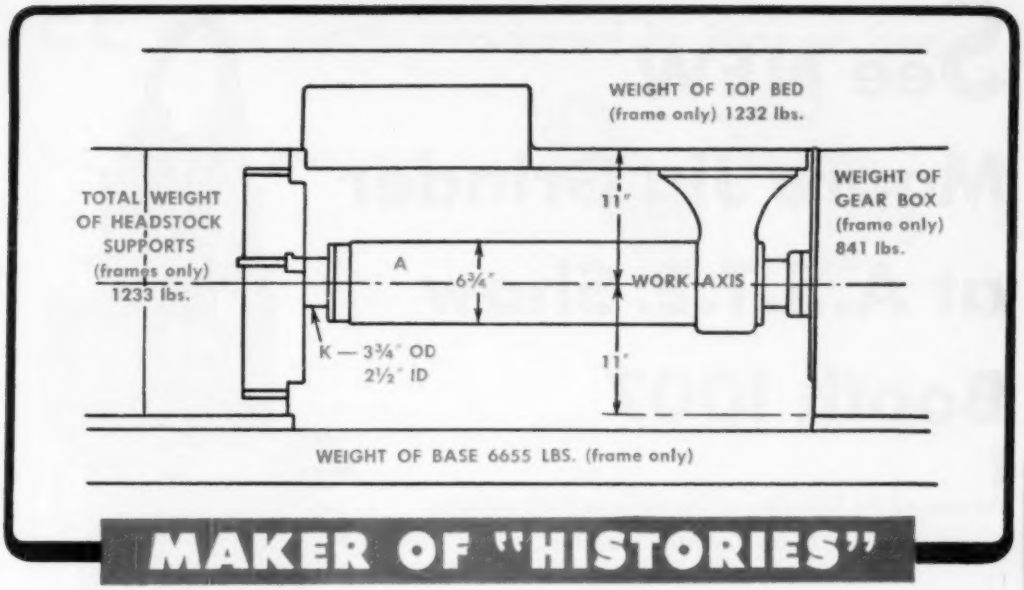
A typical setup of Wales Type "BL" Hole Punching Units in a press brake at Stainless Food Equipment Company.

● Once metal fabricators start to use money-saving, time-saving Wales Equipment, they invariably change over all their hole punching and notching operations to standardize on this tooling method. There is no substitution for experience to fully appreciate the patented advantages of Wales Hole Punching and Notching Equipment.

Write today for your copies of the Wales fully-illustrated, functionally-colored catalogs BL and N that give the inside story of Wales Equipment that has revolutionized tooling practice.

WALES-STRIPPIT CORPORATION
George F. Wales, Chairman
373 PAYNE AVENUE, NORTH TONAWANDA, N.Y.
(Between Buffalo and Niagara Falls)
WALES-STRIPPIT OF CANADA, LTD.
HAMILTON, ONTARIO
Specialists in Punching and Notching Equipment

Visit our Booth 908 at the ASTE Show in Philadelphia April 10-14



MAKER OF "HISTORIES"

The above drawing illustrates a Tooling Area that has staged many outstanding cases of machine adaptation and performance. Case histories are very useful as examples of machine adaptation, but their blanket use as unqualified proof of dependable performance is not convincing.

Buyers know that varying requirements and conditions of various plants make "buying what the other fellow buys" an unsafe practice. They know that good case histories will result if machine facilities have been properly selected. No plant could long afford to have it otherwise.

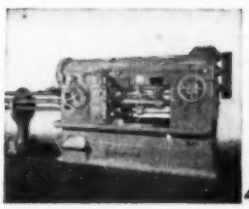
A "top performer" of the 1½" SIX SPINDLE CONOMATIC TOOLING AREA, shown above, is the MAIN END SLIDE. The specific data given tells why:

1. **It has a greater maximum load recommendation and a stronger frame support than the main end slide of any other "automatic".**

   The 272 lb. alloy carburized steel Main End Slide, A, is 33⅝" long, and has a maximum load recommendation of 4800 ft. lbs. Its round surface is machined to close limits. It is supported in nickel iron, split, sleeves on the alloy steel Way, K, with a total bearing of 136.9 sq. ins.

2. **It handles more work; has more adaptable tooling positions, and more selective feeds, than the main end slide of any other "automatic".**

   The 27⅛" tooling-length of the Slide handles shaft jobs up to 18" in length. The 2⅝" swing clearance permits die-head threading to full machine capacity in any, or all, six positions without Slide alteration. Nine pairs of pick-off gears give 68 feed changes for each work spindle speed.



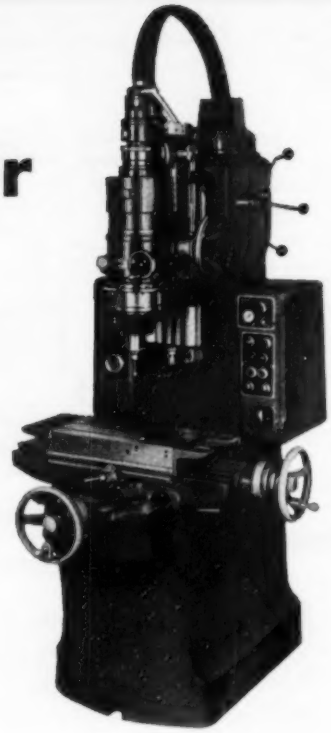
Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

See NEW Moore Jig Grinder at A.S.T.E. Show Booth 1007



Advanced Jig Grinding of *Contours* as Well as Holes Features Larger, More Versatile Machine.

Moore, originator of the Jig Grinder, proudly announces that: Any contour—regular or irregular—can now be ground with all the speed and accuracy which has made the Jig Grinder so popular for locating and grinding straight and tapered holes. The new No. 2 model expands the original Jig Grinder principle to include form and chop grinding of contours, so that the most complex die section can be completely ground in a fraction of the time required by other means.

The new model is the result of the experience of over 500 Moore Jig Grinder users (including our own toolroom) during the last ten years.

We've kept all the field-proven features of the No. 1, and added these advantages:

1. GREATER CAPACITY AND SIZE
2. FEATURES TO FACILITATE CONTOUR AND CHOP GRINDING
3. INFINITE GRINDING SPEEDS FROM 12,000 TO 60,000 R. P. M.
4. MORE POWER TO GRINDING WHEEL
5. INFINITE FEEDS UP OR DOWN
6. SLOT GRINDING ATTACHMENT
7. SPINDLE HOUSING HEAT CONTROL

NO. 2 JIG GRINDER SPECIFICATIONS

Capacity—
Table size—10" x 19"
Table movement—10½" x 16½"
Table top to wheel collet—0 to 16"
Spindle to column ways—10"
Spindle to column below ways—12½"

Spindle Speeds—
4—85-170-255-350
Spindle feeds by airpowered hydraulic control—infinite from 0—120 strokes.

Grinding Speeds—
12,000 to 60,000—3 heads

Other Moore Equipment On Exhibit

NO. 2 JIG BORER
(see facing page)

PANTO-CRUSH WHEEL DRESSER
—combining roll-crushing and diamond dressing.

MOTORIZED CENTERS
—for use on surface grinder, jig borer, jig grinder, drill press, etc.

HOLE LOCATION ACCESSORIES
—full complement of small tools for 3 basic steps—locating, cutting, inspecting.

Have you bought your copy of "PRECISION HOLE LOCATION"?

Over 6,500 copies of this valuable book on toolmaking practices have been sold to date. Available at special price of $3. 448 pages, over 400 illustrations, 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Send check or money order to Moore Special Tool Co., Inc., Bridgeport

SEE these parts produced in Moore booth

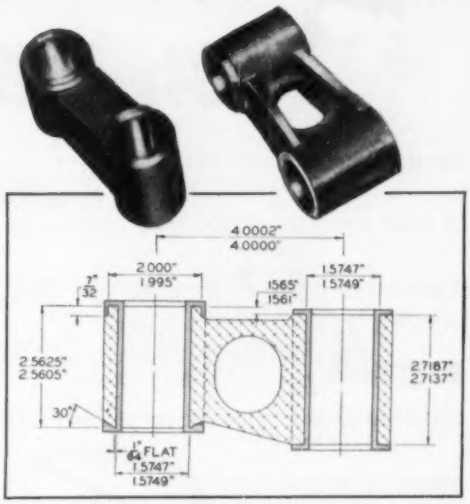
Jig Boring close tolerance work cuts production time 90%

It took 3½ hours to machine each of these aluminum-alloy supporting arms, used on our Moore Panto-Crush Wheel Dresser, on a boring mill. Now—on our No. 2 Jig Borer—it takes only 22 minutes per piece for lots of 100—a time saving of 90%. Hole diameters and between-centers dimensions are held to 0.0002" to insure extreme accuracy between pivot points in the wheel dresser and allow the installation of precision bearings in the holes. Read the job details at the right.

Moore Jig Borers are being used more and more on short-run production of precision work—boring, drilling, reaming and inspecting precisely located and machined holes in production parts, as well as in dies, jigs and other tools.

Write today for our new 24-page catalog, containing other examples of time- and cost-cutting Jig Borer operations.

MOORE SPECIAL TOOL CO., INC.
740 UNION AVE., BRIDGEPORT 7, CONN.

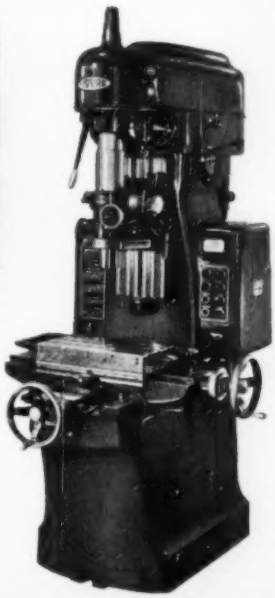


Two holes, three flat and one beveled face and shoulder on one boss (the areas crosshatched in drawing) are all machined on the Jig Borer—in only 22 minutes.

Everything done on Jig Borer, using easily-made holding fixture that provides both milling and boring positions

Oper. No.	Operation Name	R.P.M.	Feed	Min.	Sec.
1	Load and mill ribs — Single Point fly cutter	1000	H	1	00
2	Set Up and rough bore — two holes	2000	.0015	2	10
3	Rough face two top surfaces Single Point fly cutter — Remove part to cool —	1000	H	1	35
4	Load and second rough bore two holes	2000	.003	1	50
5	Finish bore two holes	2000	.0015	2	40
6	Check two holes for size			1	00
7	Rough and finish 30° bevel	800	H	3	00
8	Rough and finish one bottom face	800	H	1	00
9	Finish face two top surfaces Out-feed chuck	800	.0025	4	35
10	Rough and finish 2" diameter shoulder	400	H	3	00
	TOTAL TIME			**21**	**50**

Checking hole size—held to 0.0002". Simple holding fixture provides both boring and milling positions.

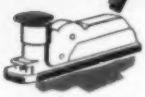


No. 2 Jig Borer with table working surface of 10" x 19"

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS · DIE FLIPPERS · MOTORIZED CENTERS · HOLE LOCATION ACCESSORIES

Black Eye

Expensive machining costs hogged the profits of a staple machine  manufacturer. He needed a lightweight model to meet competition. He knew magnesium was light and strong, but wrongly supposed it had a black eye for shopwork. Then he took his problems to light-metal headquarters, Aluminum Company of America. He learned simple shop practices make handling magnesium no problem.* He found that fellow-manufacturers use over a million pounds of magnesium every month. He learned magnesium castings machine fast and have a high strength-weight ratio. He got books on designing and fabricating magnesium, plus all the technical aid he needed. Now he buys magnesium permanent-mold castings from American Magnesium at exceptionally low prices. Machining and handling costs dropped, profits soared. His new light-weight model squelches competition.

*No change in insurance rates.

These two, free books on magnesium and our broad technical experience can help your products, too. Write Aluminum Company of America, sales agent for American Magnesium Products, 2106D Gulf Bldg., Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

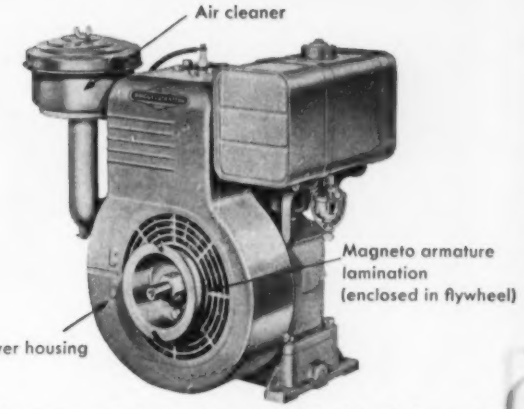
How Bliss Presses Produce these Parts for

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

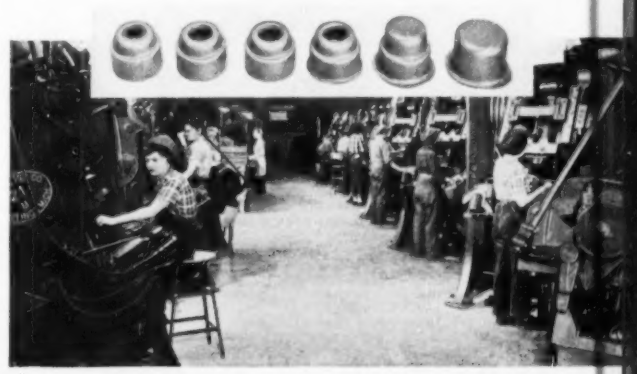
The majority of presses at Briggs & Stratton Corporation's plants in Milwaukee are Bliss-built. According to Briggs & Stratton production men, Bliss equipment has "met the test" by performing the variety of blanking, drawing, forming, piercing, beading and trimming operations required for the parts shown here. Put Bliss to the test on *your* pressed-metal problem. The leaders make Bliss the source for press information and counsel. See how by writing today for your free copy of "The Dominant Factor in Pressed Metal Production."

E. W. BLISS COMPANY • TOLEDO 7, OHIO

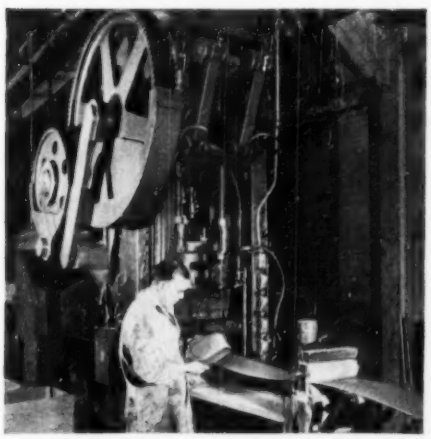
Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery



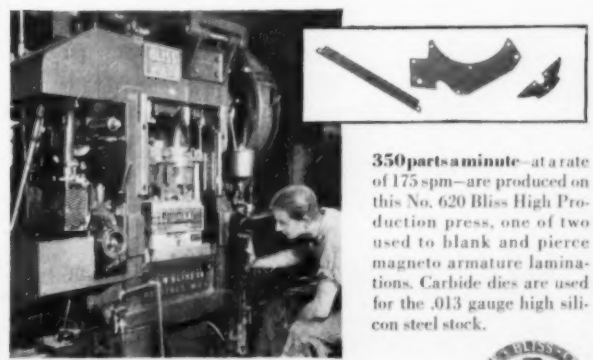
Briggs & Stratton one-cylinder 4-cycle gasoline engine. The air-cleaner shell, blower housing and magneto armature laminations (enclosed in flywheel) are produced on Bliss Inclinable, Toggle and High Production presses.



A battery of 13 Bliss Inclinable presses produces air-cleaner shells for Briggs & Stratton gasoline engines. Shell is .030" steel, 2 37/64" deep—blanked and drawn in *one* operation. Stampings are carried by conveyor to other presses, where they are formed, pierced, and trimmed at a rate of 1700 an hour. Inset shows the various stages.



Bliss No. 3½-C Single Crank Toggle press is used to blank, draw, bead and trim the blower housing. The shell is .030" steel, 2¾" deep. Production rate—from automatically fed coil stock—is 600 shells an hour.



350 parts a minute—at a rate of 175 spm—are produced on this No. 620 Bliss High Production press, one of two used to blank and pierce magneto armature laminations. Carbide dies are used for the .013 gauge high silicon steel stock.

From the right press for a given job... to a complete press room... IT'S BLISS

BLISS BUILT

YOU MIGHT SAVE 14,560 HOURS IN ONE YEAR. It won't cost you anything to check the production time of the machines on your floor against the estimated production times of new available machines.

One company had steel rings with a 24-inch I. D. and 10-inch length which required 700 minutes each, floor to floor. Their Grinding Department estimated 16,640 hours grinding time for the year.

Bryant figured the job at 2,080 hours on a machine with a five-foot faceplate—a saving of 14,560 hours in one year.

You don't have to be a financial wizard to see that a machine like this pays for itself in short order.

Bryant Chucking Grinder Company is prepared to give you accurate figures on production and costs so that your management can translate them into terms of investment. Send your present production figures to Bryant now. We will give you data which may help you buy that much needed machine.

Remember—it won't cost to inquire.

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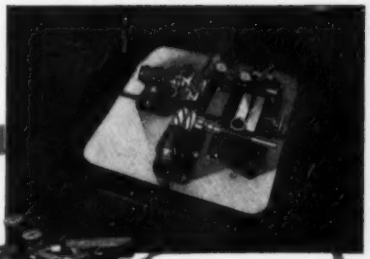
Gear errors **and** Gear noise

should be discovered long before the gears reach final assembly . . .



See this and other Red Ring equipment in BOOTHS 601 AND 602 at the "COST CUTTING EXPOSITION" in Philadelphia, April 10-14

There is a profit in scrap for the scrap dealer, but most certainly not for the gear manufacturer who suddenly discovers that an entire lot of gears have to be scrapped because they fail to meet tolerance requirements or because they are too noisy.

If economy is important in your plant, the time to find out about machining errors is right at the machine which causes the trouble—not after all the subsequent operations including heat treatment have been completed and the gears assembled in some power unit.

The best insurance against high cost of scrap gears is the use of gear checking machines right down there in the plant where the gears are being produced and where they can be checked periodically by the machine operators.

The Red Ring Gear Checker quickly reveals any dimensional errors and the Red Ring Gear Sound Tester immediately puts an accusing finger on noisy gears. Both machines have laboratory accuracy, they can be used anywhere in the plant or inspection department and they prevent a great deal of waste.

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How to put your plant ...IN THE PINK

Weed out old-fashioned cutting fluids and replace with CIMCOOL©—the revolutionary cutting fluid that covers 85% of all metal cutting operations.

This different cutting fluid replaces all water emulsions and all but a few highly compounded specialty oils. And Cimcool does a *better* job.

The root of Cimcool's difference is this—it's a *chemical emulsion* that combines friction reduction and cooling capacity in a degree never before attained.

So, no wonder the list of plants using Cimcool is growing larger every week. For Cimcool increases tool life, and there's less down time. It's longer lasting in machines, too . . . and reduces the cost of cleaning and changing. And Cimcool permits faster speeds. One test run will convince you!

Write for free booklet, "CIMCOOL Gives the Answers." Address, Sales Manager CIMCOOL Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

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A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

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Kaukauna universal DRILLING and TAPPING MACHINE

MODEL 140-U Universal Portable Drilling and Tapping Machine for Heavy-Duty Service.

A truly universal machine for heavy-duty drilling, tapping, boring and spot facing operations. Quickly adjusted at any angle—or compound angle—in any direction—at any location in the shop. Completely self-contained. Completely portable and readily moved to the toughest, most difficult, hard-to-get-at jobs.

extreme flexibility

- √ Column, rail and headstock move under power as a unit on the machine runway.
- √ These machine elements rotate on the column base duplicating the arm movement of a radial drilling machine.
- √ Vertical power movement of rail and headstock unit on column for high reach.
- √ Horizontal power traverse to headstock on rails at any angle to runway travel.
- √ Power swiveling of the headstock on trunnion in any plane through 360°.
- √ Power swiveling of trunnion on rails in vertical plane through 180° positions spindle quickly.
- √ Power and hand traverse to the spindle.

completely portable

Easily moved by overhead crane to the job. Does not require precision leveling. Eliminates the movement of large, heavy work to the machine. Reduces set-up time, labor and production costs.

Send for complete information on this new, heavy-duty machine which simplifies set-up and reduces tooling costs on production and job shop work. Details and specifications gladly supplied upon request.

The Complete Kaukauna Line includes:

MODEL 125-U	Universal Portable or Fixed Location Drilling and Tapping Machine for Medium-Duty Service with 2½" Spindle, No. 4 Morse Taper, 5 H.P. Drive.
MODEL 125-HR	Portable or Fixed Location Drilling and Tapping Machine for Medium-Duty Horizontal Work with 2½" Spindle, No. 4 Morse Taper, 5 H.P. Drive.
MODEL 140-U	Universal Portable or Fixed Location Drilling and Tapping Machine for Heavy-Duty Service with 4" Spindle, No. 5 or 6 Morse Taper, 10 to 20 H.P. Drive.
MODEL 140-HR	Portable or Fixed Location Drilling and Tapping Machine for Heavy- Duty Horizontal Work with 4" Spindle, No. 5 or 6 Morse Taper, 10 to 20 H.P. Drive.
MODEL 1030	Horizontal Portable or Fixed Location Drilling and Tapping Machine with Tilting Head for Medium-Duty Service with 3" Spindle, No. 5 Morse Taper, 7½ H.P. Drive.
MODEL 1040	Horizontal Portable or Fixed Location Drilling and Tapping Machine with Tilting Head for Heavy-Duty Service with 4" Spindle, No. 5 or 6 Morse Taper, 10 to 20 H.P. Drive.

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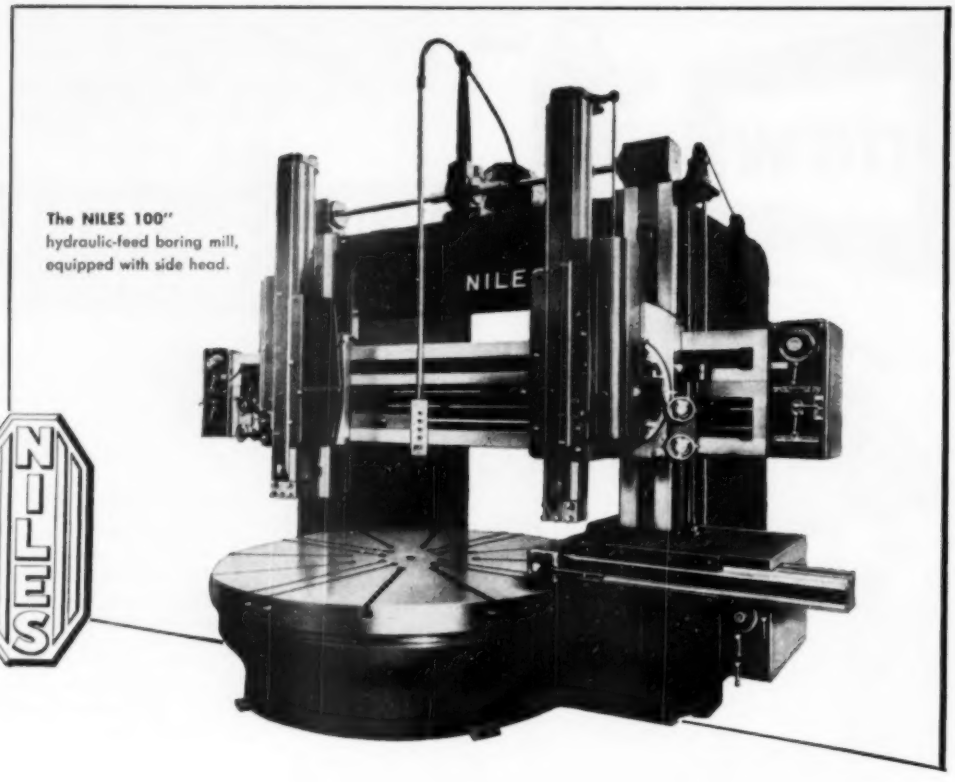


The NILES 100" hydraulic-feed boring mill, equipped with side head.

NILES hydraulic-feed boring mills

Massive construction of Niles boring mills assures ample rigidity to take the stresses of high-speed cutting—yet with no loss of accuracy. You will get considerably faster boring and turning, particularly with tungsten-carbide tools.

With fingertip control of the hydraulic feed, your operator can effortlessly and efficiently operate his mill. He has, for example, infinite feed selection while the machine is running—he can make fast tool placements. Reduced operating fatigue will tend to improve his accuracy.

Eighty years of building large boring mills stand behind these new Niles machines. You will find them precision products in every respect, designed to give you better production—consistently.

* * *

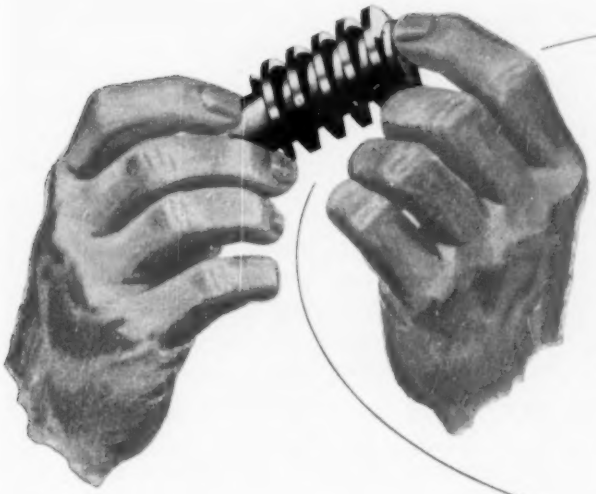
Niles Vertical Boring Mills are built in all standard sizes from 72 inches up, with either hydraulic or mechanical feed and with or without side head. For further information, call the Lima-Hamilton sales offices in New York, Chicago or other principal cities, or write directly to Lima-Hamilton Corporation, Hamilton, Ohio.

LIMA HAMILTON CORPORATION

DIVISIONS: *Hamilton, Ohio* — Niles Tool Works Co.; Hooven, Owens, Rentschler Co. *Lima, Ohio* — Lima Locomotive Works, Inc.; Lima Shovel and Crane Division. *Middletown, Ohio* — United Welding Co.

PRINCIPAL PRODUCTS: Niles heavy machine tools, Hamilton diesel and steam engines, Hamilton heavy metal stamping presses, Hamilton-Kruse automatic can-making machinery, Locomotives, Shovels and cranes, Special heavy machinery, Heavy iron castings, Weldments.

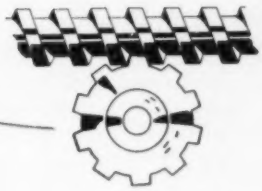
GET THEM BOTH!



MACHINABILITY

and

WEAR-RESISTANCE



with *Republic* COLD DRAWN ALLOY STEEL BARS

Machinability that enables you to produce small metal parts efficiently and economically . . . *wear-resistance* that enables those same parts to stand up under severe service . . . you get both *and more* when you use Republic Cold Drawn Alloy Steel Bars.

Produced by Republic's Union Drawn Steel Division, these bars are unsurpassed for close tolerance, accuracy of section, fine surface finish and UNIFORM MACHINABILITY. They are strong, tough, and uniform in response to hardening treatment. They're made to withstand shock, strain, wear and heavy loads without weakening.

Republic Cold Drawn Alloy Steel Bars are available in all popular analyses, in standard shapes and sizes, and furnace treated (annealed, normalized, spheroidized, stress relieved or carbon corrected) to your requirements.

Republic metallurgists and machining experts will be glad to show you how to use them to greatest advantage. Write, wire or phone:

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ALLOY STEEL BARS

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MACHINISTS' FILES

MILLED TOOTH AND SPECIAL PURPOSE FILES

SWISS PATTERN FILES

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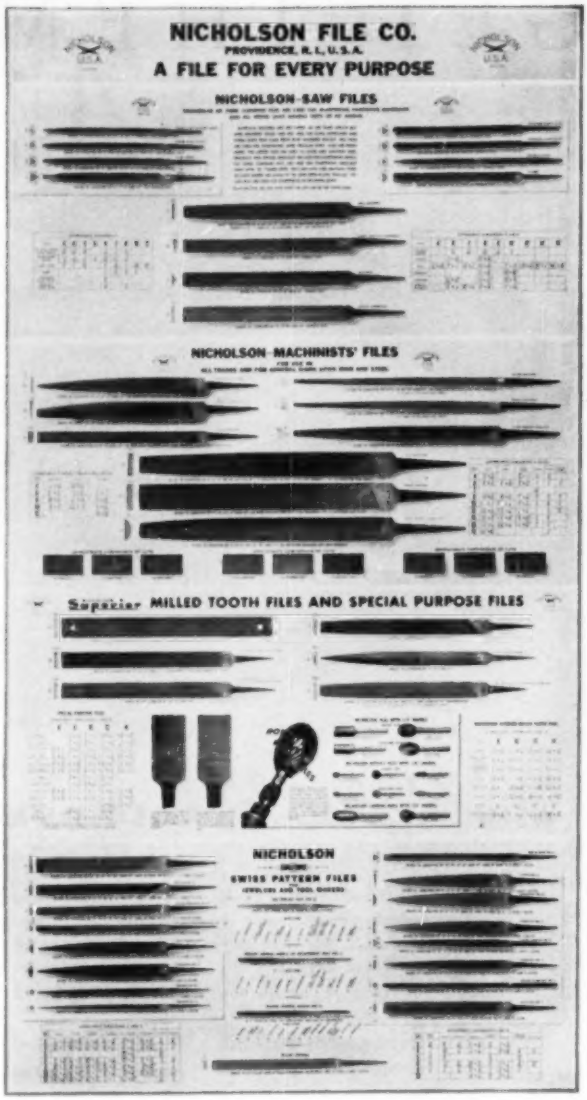
The Chart (durably cloth-backed) is a valuable aid to modern shop economy toward the selection of *The right file for the job*. Purchasing, production and tool room heads find it a most helpful guide. Shop "school" training classes learn rapidly through its use in "blackboard demonstrations."

If you will write directly to us, on your business letterhead, we will send your free copy of the Chart (only one available per customer).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Also free with each Wall Chart: A copy of the famous Nicholson book, "File Filosophy"

—a valuable 48-page illustrated "textbook" on kinds, use and care of files and elaborating on the characteristics of many of the types shown in the Chart.

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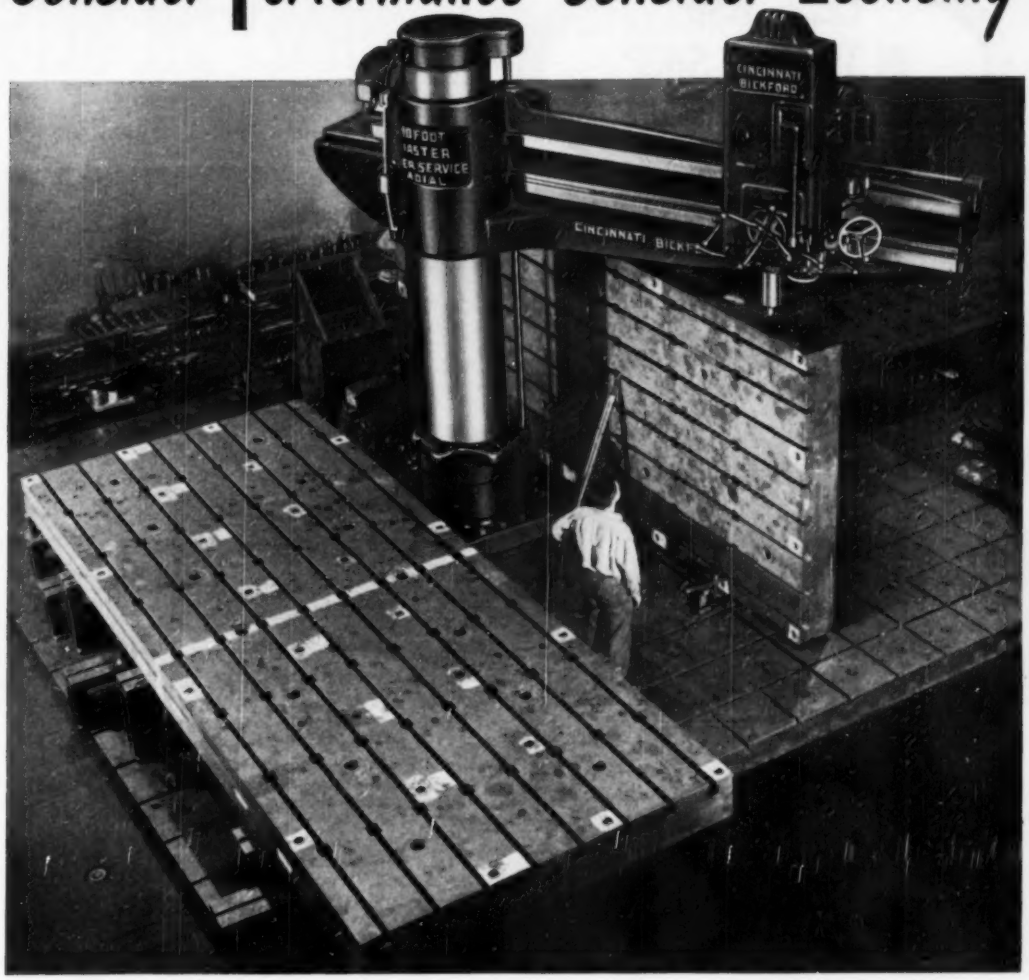
Consider Performance-Consider Economy



Power and the rigidity to apply that power accurately are found in the Cincinnati Bickford Master Super Service Radial.

Long maintenance-free, low-cost operation under severe conditions is assured.

Finely balanced, with easily manipulated, convenient controls, these machines bring operator ease and a smooth, rapid performance.

The rigid Super Service column and arm construction give accurate drilling on the tallest jobs.

● Write for Circular R-22—and check the many features of the Cincinnati Bickford Master Super Service Radials.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE

Radials 7½" dia. col., 2½" arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
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Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

LESS TIME IN THE DIE SHOP

Die assembly work is easier and more accurate when it's based on reliable Danly precision.

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LONGER LIFE ON THE PRODUCTION LINE

Hardened, ground and lapped leader pins and precise bushing fits assure accurate die relationship and more parts per grind.

Which DANLY branch is closest to you?

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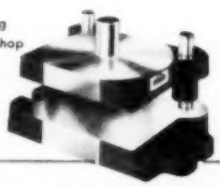
Danly Die Sets will assure the performance of your dies... and they mean greater convenience too! Large or small, standard or special, there's a Danly Die Set quickly available to meet your specific tooling requirements.

All standard Danly Die Sets are "on hand" in a nationwide system of assembly branches for prompt delivery from stock!

WRITE FOR FREE BULLETIN

... and see how Danly's special die set machining service will mean important savings in your tool shop.



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DANLY MACHINE SPECIALTIES, Inc. 2100 South 52nd Avenue, Chicago 50, Illinois

OVER 25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

SPOT NEWS of Metalworking

- **Increase in U.S. arms procurement to bolster economy** is possibility. NSRB has been instructed—not by military—to see how $1-$3 billion more in military hard goods procurement would help economy. With unemployment now at 4.7 million, NSRB's job is to see if slack is in metalworking, steel, engineering industries, or in soft goods. If it's in hard goods, look for a jump in defense spending.

- **Separation of chromium plate from base metal is eliminated** by new electrolytic plating process developed by small Illinois plant. Standard industrial chrome finishes, plus hard chrome plate up to 1100 Bhn, can be produced. Plating applications can be controlled to tolerances of less than 0.0001 in. Process permits plating of cast iron as well as industrial steels, is especially applicable to hard chrome plating of cutting tools.

Hot extrusion of steel shapes, similar to aluminum and brass, is being done in France by Ugine-Sejournet process. Lubricant is reported to be a ceramic, like glass. It will be licensed to one or more firms in U.S. One important application: extruding, rather than rolling, of structural steel.

- **Refiguring company's overhead,** putting it on more realistic 10-month-year basis, is advocated by automotive parts executive. Says present overhead is computed on 12-month basis whereas his company rarely works the 12 months because plant is shut down more than month every year by strikes in steel, coal, and strikes among his customers' employees. Add vacations, and the lost time mounts up. He realizes that once overhead costs are so refigured, price of his products must be increased.

- **Anti-aircraft procurement by Defense Dept. will change soon.** Higher speeds, altitudes of today's planes surpass capabilities of conventional anti-aircraft rifles. Pressure on now for guided missile interception of air units by ground forces. New 75 mm skysweeper anti-aircraft rifle developed by Ordnance may mark end of development in this field. Guided missile will replace it.

Shortage of steel wire has one user thinking of buying European-made steel offered here competitive with U.S. rods and wire. Claims he can have German rods delivered to his plant, after duty is paid for $40 per ton less than he can buy locally. Big question is quality.

- **Phosphate coatings,** originally developed for cold extrusion of steel, are proving superior to graphite in many drawing operations. After phosphate coating, blanks are roller coated with light soap-base compound just before drawing.

- **Britain's Rover Co. eventually will produce gas turbine weighing less** than conventional auto engine of same power. Present turbine is best for larger cars, not yet suited to Britain's smaller cars. Initial production will be sold abroad, home market getting its share after quantity output is reached. (See story, page 179.)

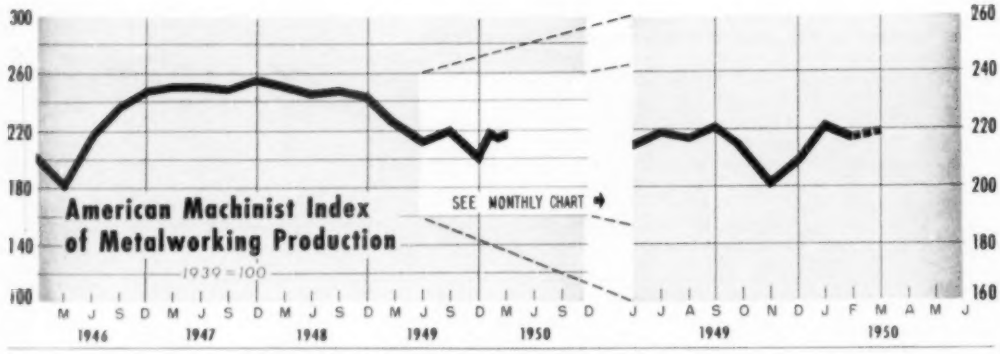
- **Cold extrusion of 95-lb. 155-mm shell** will be tackled by Mullins Mfg. Co., Salem, Ohio. Ordnance has given company contract to produce small quantities of this, and several other, cold extrusions.

- **Defective refractory bricks supplied by Czechs**—a form of sabotage practiced by Cominform countries after Tito's bolt—caused delay on installation of new 150-ton blast furnace in Yugoslav steeel works at Sisak. (See story on Yugoslav metalworking, page 176.)

- **Guaranteed annual wage will be pushed by unions next year.** Walter Reuther says UAW-CIO will seek guarantees after it settles on pensions and health insurance. Steel workers will revive issue at their convention in May.

NEWS

Gaging Metalworking



Third Quarter Looks Brighter as Metalworking Operations Expand

Metalworking is looking up as operations head into the spring months. Second quarter looms as one of most active since war's end. What's more, third quarter begins to appear brighter, with no sharp drop anticipated.

Detroit is bolder in its optimism about latter part of year. Meanwhile April, May and June will be boom automotive months. Prospects for many lines of durable goods are for a second half-year as strong as first. Machinery demand, including machine tools, is much better than in 1949 (see New Tooling on page 179).

• • •

Many makers of variety of metal products say that business is much ahead of last year. Consumer goods output is at near-record heights; that in turn means high employment currently for component-parts suppliers.

Competition for steel is lively. Hard-pressed Cleveland users are sending buyers into East, including New England, to get tonnage. They are absorbing reshipping charges on sheet, strip, bars and even wire stock.

Conversion deals still are popular in automobile industry to insure enough steel to run on heavy schedules. Detroit reports such deals may last well into or through third quarter, particularly on cold-rolled sheets.

Chrysler fooled smaller steel consumers, who expected to get more tonnage during Chrysler strike, by taking steel against day when it would attempt to catch up for lost time. In 1949 Chrysler used 1,300,000 tons of steel.

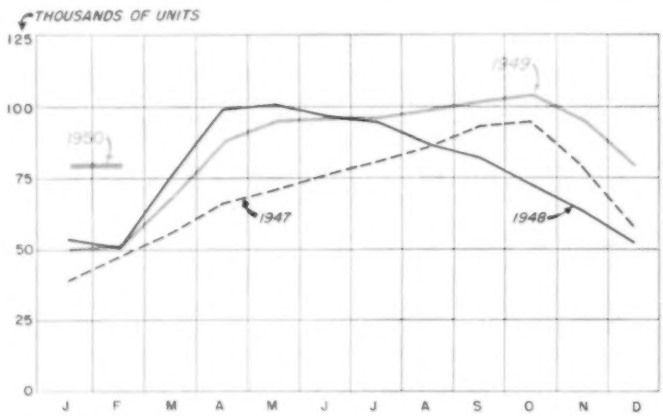
• • •

Gray iron foundries are doing much better. They will average better than 60% during first half

Record New Housing Starts for Months of January, February

Month	New nonfarm units started			
	1947	1948	1949	1950
Jan.	39,300	53,500	50,000	[1] 80,000
Feb.	48,800	50,100	50,500	[1] 80,000
Mar.	56,000	76,400	69,400	.....
Apr.	67,100	99,500	88,500	.....
May	72,900	100,300	95,400	.....
June	77,200	97,800	95,500	.....
July	81,100	95,000	96,100	.....
Aug.	86,300	86,600	99,000	.....
Sept.	93,800	82,200	102,900	.....
Oct.	94,000	73,400	104,300	.....
Nov.	79,200	63,600	[1] 95,500	.....
Dec.	58,800	52,900	[1] 79,000	.....
Total	**849,000**	**931,700**	[1] **1,025,800**	.....
Mo. Avg.	70,750	77,600	[1] 85,275	.....

Source: Dept. of Labor (1) Prelim. estimate



INDEX

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Electrical Manufacturing		**255**	**246**	**255**
Automobiles, Trucks		**201**	**218**	**197**
Transportation Equipment		**203**	**208**	**256**
Other Metalworking		**234**	**234**	**246**

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

*Estimated (p) Preliminary (r) Revised

of 1950, against 52% in January and 35% last summer. These markets for gray iron castings are looking up: automotive, machine tools, home construction, farm implements. Situation competitively has eased as result of 200 foundries going out of business since war's end.

• • •

Same story is reported in screw machine products as in castings. Lowest point since 1938 was reached in middle of 1949. Now, operations are up to 65% of 1940 rate. April should be peak month for year, if prewar seasonal pattern holds, as expected. Competition is keen for existing orders.

• • •

If you have a metal product for the home, you should be doing all right. Home builders have completed their most spectacular winter. They are opening new business for many industries, such as appliances and furniture.

Builders started 80,000 houses in both January and February, unprecedented number for that time of year. It is 60% better than last year. Home building has been going great guns ever since spring of 1949. It should stay in high gear all of this year. 1950 estimate: about 1 million new "starts."

• • •

Revisions in AMERICAN MACHINIST's Index raised level for January from preliminary 213 to 221 (1939 equals 100). Chief change in components was in automobiles, when early figures understated gain in employment between December and January.

Overall index fell four points to 217 in February, thanks to Chrysler tie-up. Motor car output dropped from 218 in January to 201 in February. Coal strike had some effect on February automobile rate, too, not noticeable in March. AMERICAN MACHINIST estimates March index figure at 219, though no official data will be at hand until mid-April. Almost all segments of metalworking report continuing good business.

• • •

Business optimism is confirmed by Department of Commerce figures. New orders received by manufacturers in January were $18.8 billion, 12% above December and over level year ago.

Durable goods makers, in particular, have cause to cheer. Reason: January orders topped December's by 23% and raised backlogs by $1.3 billion.

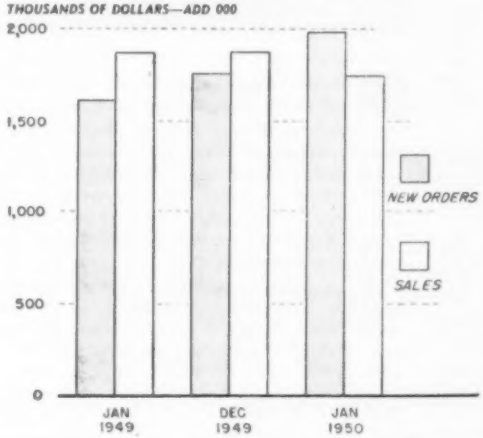
Industrial and electrical machinery gained 13% in new orders. That's a good indicator, especially since it added up to an expanded backlog, reversing long-time trend in other direction.

Appliance inventories at factory, distributor and retailer levels are way down, and most appliance makers haven't been able to meet 1950 consumer demand. Reasons: big upturn in buying last year in normally off-peak seasons, plus effects of steel and coal strikes.

• • •

Upturn in railroad equipment field continues. Diesel locomotive orders have been good. Even freight-car bookings look good. Westinghouse is building for Pennsylvania two new-type electric locomotives combining alternating current power supply with direct current driving motors.

Machinery Sales Drop Below New Orders



MACHINERY MANUFACTURERS' new orders versus sales changed in pattern from previous months, January 1950 sales reaching $1,750,000 compared with new orders of $1,982,000. In Jan. 1949 new orders were $1,617,000 and sales $1,869,000. For Dec. 1949, new orders were $1,759,000, sales were $1,873,000.

OVER $2,000 A MONTH SAVED*

On 5 hydraulic process millers using TEXACO REGAL OILS (R & O)

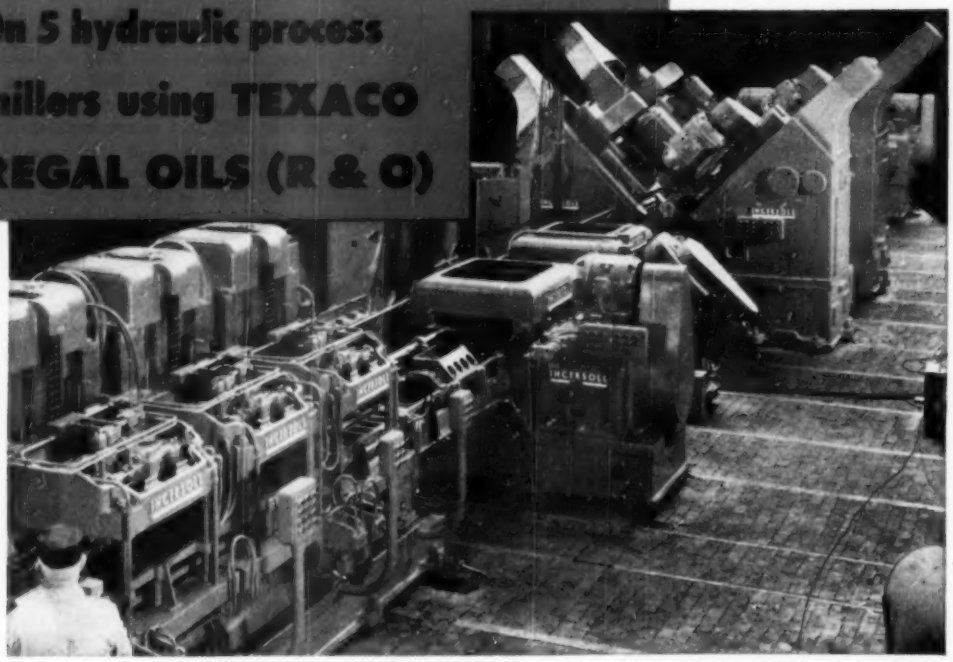


Photo courtesy of The Ingersoll Milling Machine Company

JUST by introducing *Texaco Regal Oils (R & O)* into the hydraulic systems of five Ingersoll Process Milling Machines, this plant is saving more than $2,000 a month. The Texaco Lubrication Engineer's report tells why—

"Although these machines are operating at top speed in extremely severe service, with *Texaco Regal Oils (R & O)* there has been an absolute minimum of downtime – no rust, no sludge, no foam, no sticking – none of the usual hydraulic oil troubles. In addition, service life of the *Texaco Regal Oils (R & O)* is several times that of any hydraulic oil previously used."

On the basis of this outstanding performance, use of *Texaco Regal Oils (R & O)* has been extended throughout the plant and to the hydraulic systems of new machines of all types as fast as they are installed.

A Texaco Lubrication Engineer will gladly tell you more about *Texaco Regal Oils (R & O)* and explain how you can use them to improve hydraulic efficiency and make worth-while savings. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

*Name of this Texaco user on request

VISIT TEXACO BOOTH 512, A.S.T.E. INDUSTRIAL COST-CUTTING EXPOSITION, PHILADELPHIA, APRIL 10-14

TEXACO

TEXACO Regal Oils (R&O)

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TUNE IN . . . TEXACO STAR THEATER starring **MILTON BERLE** on television every Tuesday night. See newspaper for time and station.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Management's Most Valuable Asset

What is the most valuable asset for any metalworking plant to have?

"The spontaneous cooperation of the men who do the work" was the reply of H. L. R. Emmet in a recent talk before the American Society of Mechanical Engineers. We heartily subscribe to Mr. Emmet's answer.

It is not enough to possess up-to-date machinery. It is not enough to have a better product than your competitor. It is not enough to have a factory laid out for most economical manufacture.

If you have all of those assets, and if your men are faint-hearted about their work, your success will be only limited at best.

YOU DO NOT ATTAIN in three easy lessons the cooperation of which Mr. Emmet spoke. Many things must be done. Here are two:

1. Treat every employee at all times with complete justice.

2. Keep all employees informed of your activities and of their relationship and yours to those activities.

Very simple, you say. No one has to tell me such self-evident truths. Maybe so, but are you carrying them out in your plant?

Let's consider the first point. It is no secret that a factory worker's little grievances often are the worst irritants. If not corrected promptly, they may be magnified out of proper proportion and lead to major trouble.

The individual employee wants to feel that he has certain inalienable rights as a factory worker as well as an American citizen.

He doesn't want those rights trespassed upon. He wishes them recognized and protected. He is essentially fair-minded; and he wants and expects management to be fair-minded in dealing with him. He does his best only when he feels that he is being treated right.

As to the second point, we have long advocated telling employees everything you can about your business. It no longer is popular, or smart, to be secretive. If you are, you arouse suspicion that you have been doing something you shouldn't.

YOUR WORKERS spend a large percentage of their waking hours at their jobs. They like to feel that they are a part of your business. It isn't unusual then that they should wish to know some of the details about it.

Apart from any other consideration, it is worth while to take your employees into your confidence with ample facts and figures about your operations—just to make them aware that they have a personal stake in the company's fortunes.

If they are convinced that your interests are theirs, they will give you that coveted "spontaneous cooperation."

JUST ONE final observation. This much-desired cooperation is possible only when the chief officer of the company makes it his business to be responsible personally for the relations with employees. There is no greater responsibility. After all, the spontaneous cooperation of your employees is your most precious asset.

Burnham Finney

low cost

Cincinnati Utility Shaper

The Cincinnati Utility Shaper answers the need of many shops for a fast utility tool—a handy shaper for a moderate price—but still retaining all of the essential refinements of the larger shapers.

The Utility model, equipped with the Universal Table, carries all the advantages of the Universal Shaper and makes an ideal tool for the tool room. It embodies all the other characteristics and conveniences of Cincinnati Shapers with the exception of Power Rapid Traverse. This feature may be added if desired.

CINCINNATI

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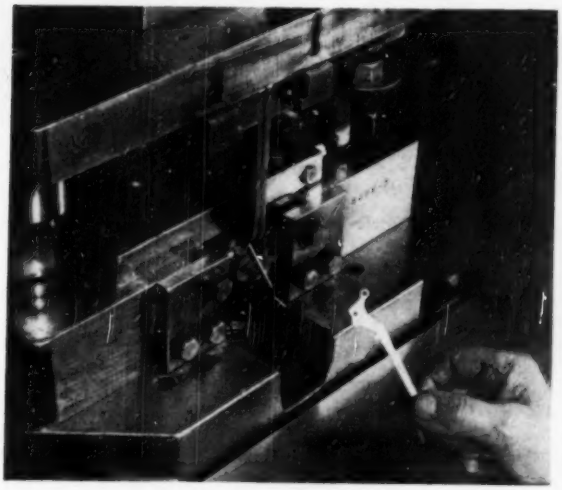
Write for the new Shaper Catalog N-5.

SECOND OPERATIONS ON STAMPINGS SHOW INGENIOUS TOOL ENGINEERING

Mass-production of small accurate parts challenges the tool engineer to develop tools, dies and machines that shave, broach, roll ball ways, curl tight edges, and induction-braze multiple connections on assemblies

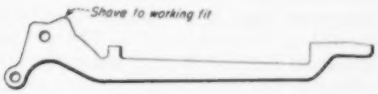
BY E. E. BANGS, Chief Tool Designer and C. V. SEAGERS, Engineer of Methods
CROTON, N. Y., PLANT, L. C. SMITH & CORONA TYPEWRITERS, INC.

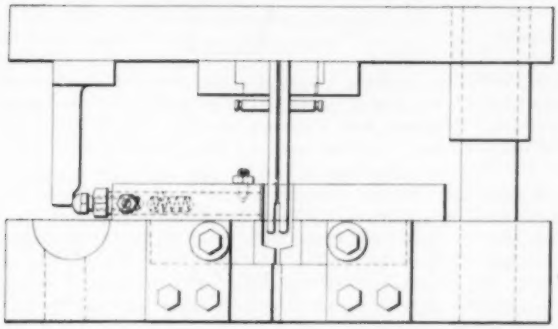


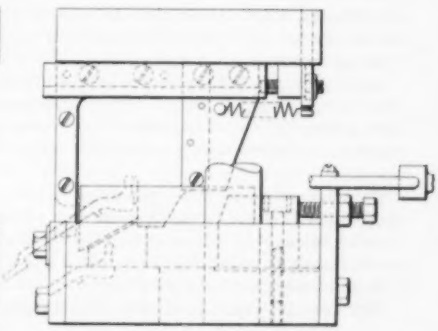
TYPE BAR

A working fit free of side shake is required when each of the 42 type bars is assembled in its segment slot. Some typewriter manufacturers grind the fulcrum end of the type bar in order to hold the close limit required. The Corona plant developed a more rapid method, by which the two faces of the part are shaved at the rate of 1200 pcs per hr.

Shaving is done by a shearing action. To hold the piece while being shaved, it is placed between the prongs of a spring steel holder attached to a slide. The top of the holder slot fits the upper







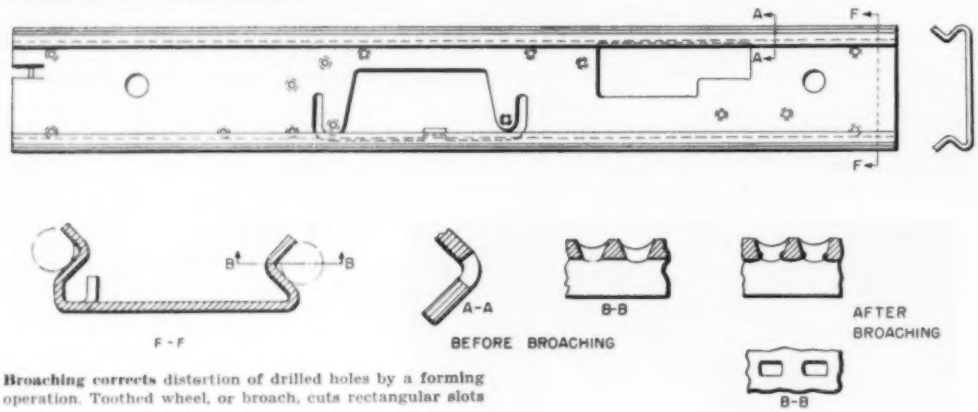
edge of the type bar but leaves the end to be shaved overhanging a pair of knives. The slide is moved toward the front of the die by a cam as the ram descends. Now the work-holder which is adjusted to have a light clamping pressure, pushes the piece through the pair of high-speed steel knives. About 0.015 in. of stock is shaved off each side of the piece and it falls out of the die.

The knives are set at an angle of 30° to the press bed, and are ground and honed to a suitable shear angle. Motion of the work in passing between the knives is both downward and forward to achieve the desired shearing action. Forward motion is controlled by a cam face 60° to the vertical and bearing against an adjustable abutment in the lower die member.

Complete safety is secured. Loading is done by hand when the holder is at top stroke and the slide carrying it is retracted by springs. The holder is in front of the knives and remains in front of them. Fingers are kept out of the danger zone. And in fact, the hand is withdrawn to pick up the next piece before tripping the press by pedal.

Shaving of the type-bar sides is not only much faster than grinding, but avoids possibility that fine grit may become embedded in the finished surfaces of the work. Other surfaces of the type bar are shaved in succeeding operations.

CARRIAGE BEDPLATE



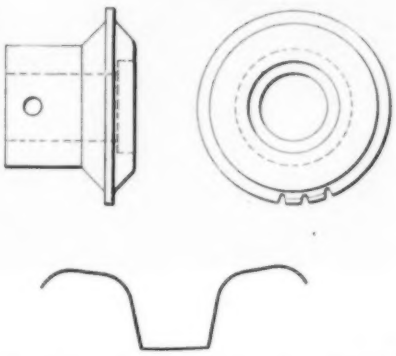
Broaching corrects distortion of drilled holes by a **forming** operation. Toothed wheel, or broach, cuts rectangular slots

Manufacture of the carriage bedplate provides several examples of clever tool engineering to obtain the desired accuracy and avoid slow operations. This part is first blanked and pierced, using cold-rolled strip steel with the thickness held between limits of 0.048-0.052 in. A total of 76 holes, which are 0.080 in. in dia are pierced in line along each edge of the blank. Each row of holes is 0.189 in. from the respective edge of the blank. Since the holes are located on 0.134 in. centers, they are too close together to be pierced in a single operation. Hence, alternate holes are pierced in one stroke, and the piece is indexed 0.134 in. for piercing the second set of holes. These holes pose an interesting problem in correcting their distortion in a subsequent forming operation.

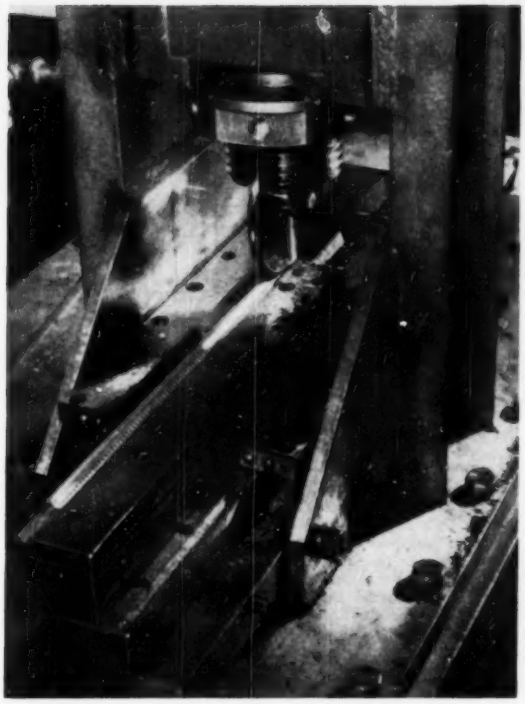
After piercing, the underside of the blank is polished along a strip at least 0.400 in. wide paralleling each edge. Finish is important here, because the polished surfaces will eventually serve as ball raceways.

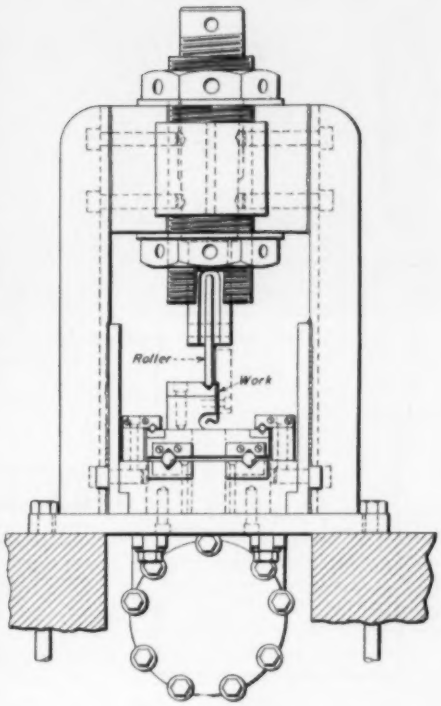
By a forming operation, the piece is given a special channel shape. The legs of the channel are formed inward to provide two 90° raceways for the balls upon which the bedplate is moved when it is assembled into the typewriter.

But now the presence of the pierced holes creates a problem. Forming of the raceways is done along the line of holes, with the result that they are distorted. And a second operation on the holes is now required, because the holes form a rack for the spacing mechanism.

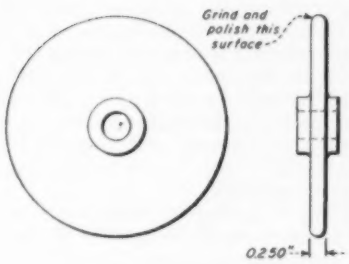


During traverse of the carriage bedplate in the typewriter, the teeth of spacing gears enter the rack holes, and cause balls to retain the desired spacing. But the spacing gear teeth cannot enter the holes, because they are distorted by forming. It is necessary to cut into the bottom of the holes in order to





Roll burnishing of ball raceways in the carriage bedplate corrects any distortion from forming. The burnishing wheel is held in a screwdown arrangement, and the work carriage is traversed under the wheel by an air cylinder. Smooth, correctly formed raceways are thus established quickly



obtain a rectangular opening having close tolerances on dimensions. This operation is performed by a toothed wheel called a "broach." As the broach is rolled in contact with the work, the teeth enter successive holes and clean up the openings to the desired shape and size.

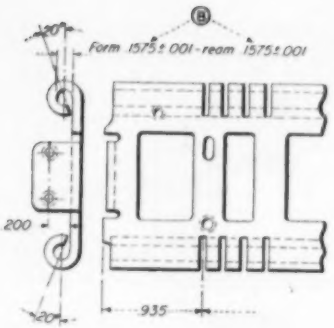
The broaching operation is performed on a special machine, which is similar to the one shown for a subsequent operation of roll burnishing the ball raceways. The carriage bedplate is located in a fixture and then the table is traversed under the toothed broaching roll by an air-operated fixture. The broach is held in a yoke fastened to a powerful adjustment screw retained in a bridge-like structure over the fixture table. Rapid and accurate correction of the holes is achieved in this manner.

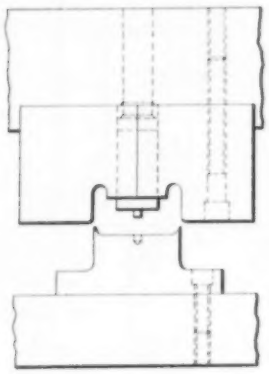
Rough Action Must Be Avoided

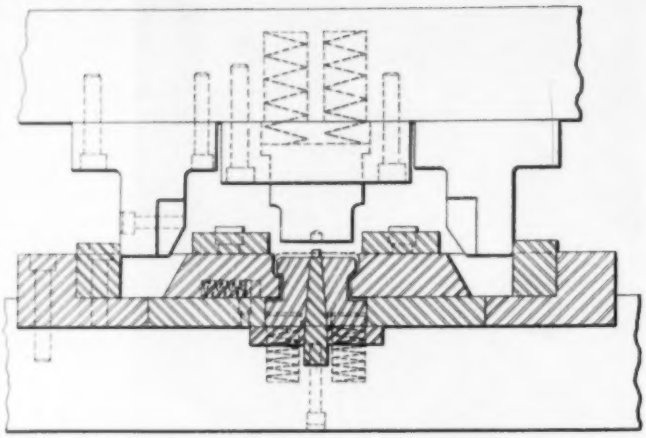
Balls must roll in a formed groove in the raceways of the carriage bedplate. If these balls were to roll only against the previously polished surface, rough action might result. It is next to impossible to guarantee that there will not be slight surface irregularities, even though the part was polished while in the blank. Some distortion might also creep in from the forming operation. Hence, to avoid any chance of trouble, two grooves are rolled into the flanks of the V-shaped raceway, by means of a roller burnishing wheel.

A setup similar to that used for broaching is employed for the burnishing operation. The carriage bedplate is clamped in a fixture with one raceway uppermost. An air cylinder traverses the machine's carriage under the burnishing wheel, which is adjusted so that sufficient pressure is applied to indent and burnish the surfaces against which it bears. By this action, uniformly smooth and correctly formed races are established, and in them the balls roll freely.

KEYLINK FULCRUM COMB







Inward curl of the channel-shaped piece is effected in this die. The part is laid legs down in a nest consisting of the cam-operated side members and the split die. As the punch descends, the side members form the channel around the die sections. When the ram ascends, the wedge in the split die is retracted, and the part is lifted off

A tight curl is formed on both edges of the keylink fulcrum comb by three press operations. Unusual feature of the curling operation is that the ID of the curl is slightly less than twice the stock thickness. The part is blanked from quarter-hard 0.0083-in. CR steel and the ID of the curl is 0.1575 ± 0.001 in. Although curling is not perfect, it is satisfactory for reaming the part. Subsequent to curling, comb slots are gang-milled in each curled edge, and reaming follows to size the hole and remove any burrs from the slotting operation.

First step in curling the blank edges is to form the piece into channel shape. The bends are not sharp, but have radii equal to one-half the subsequent ID of the bead, and in effect the first quarter of each bead is formed in this first operation.

Second operation starts the inward curl of the legs on the channel. Since curling is done inward around the die, the latter is split longitudinally. The two inner faces of the die halves are tapered to mate with a wedge that forces them apart when curling is done. Before the punch ascends, the wedge is retracted, and springs force the two halves of the punch together, thus permitting it to clear the work.

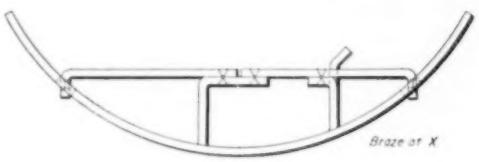
Final curling is done in a simple die with solid die together, thus permitting it to clear the work. partly curled in prior operations are forced inward around the die recesses to give the beads final shape.

BRAZED UNIVERSAL TYPE BAR

Induction brazing is often limited to assembly of rather simple parts, especially with sheet-metal components. But the Groton plant produces an involved blank consisting of a number of interconnecting straps and then folds these up into a complex assembly. Within the arc-shaped part of this assembly there are four projecting legs which form lap joints with other sections of the stamping.

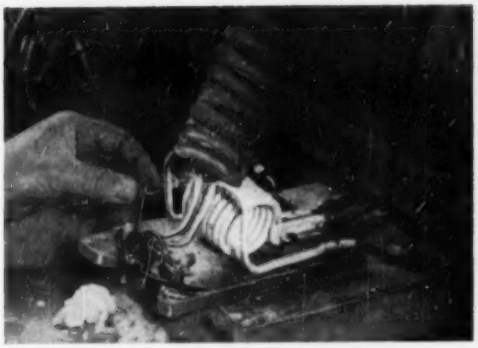
A Handy & Harman flux designed for silver brazing is applied to the assembly by dipping. And a short length of Sil-Aid wire is laid where each joint is to be made after the piece is set into a brazing fixture. Then the induction coil of the Lepel machine is energized and the coil loops at the joint areas quickly raise the metal to suitable temperature and melt the silver wire. Power is shut off by automatic control and the joints cool and solidify. Fumes are drawn off by a flexible pipe near the brazing coil.

Several other parts are likewise silver brazed on the same or similar induction heating machines.



One is the spacer bar, which is a two-part assembly. The larger part has three ears that are passed through holes in the second piece, and then are staked over. Staking merely holds the parts together while the joints are induction brazed.

From the foregoing examples, it will be seen that the work of the tool engineer and the methods engineer must be coordinated to achieve maximum results from the standpoint of economy in manufacture of quantity parts. Often such work will make use of standard machines and methods. But there are other examples, where special dies and unusual tools contribute greatly to the results obtained. Where both low cost and quality of manufacture are essential, as in typewriter parts, careful planning of tools and methods is essential.



Brazing setup for universal type bar

BETTER INSPECTION LOWERS COSTS

POOR QUALITY control and inadequate inspection is costing industry over three billion dollars annually, according to W. L. Jacoby, superintendent of gage control, Electro-Motive Div., GMC, La Grange, Ill. In telling Detroit tool engineers how efficient inspection methods can lower production costs, Jacoby emphasized "inspection is non-productive labor, so one must strive for easier and faster methods, constantly."

Reviewing the transition in Electro-Motive's inspection methods as production rose from one or two a day to ten or more, the speaker told of the inspection of engine main bearing bores for dimensional accuracy and eccentricity. This job involves bores 8.5 in. in dia and a case about 12 ft long. With a sweep bar and indicators, the operation took 3.5 hr and proved a bottleneck as production increased. Inspection provided an optical method of doing the job and it now takes only 20 min. The saving in non-productive labor was estimated as 7750 man-hours per year. At present inspection rates that soon pays for the machine and definitely lowers the cost of the job.

Another truth that Electro-Motive preaches to the shop is: "Each piece scrapped equals two pieces lost to production." The scrapped piece took the time that might have been used to make a good piece.

As it costs money to move locomotives when testing them after assembly, substantial savings have been made by testing them on a treadmill. These are now in use at both Cleveland and La Grange divisions.

Jacoby explained the vital necessity of having inspection gages ready before new parts or changed parts are started in production. If you cannot get them ready be sure to have temporary gages available.

The practice at La Grange is to supply production departments with the same or equivalent gaging so there can be no alibi on the part of either department. The plant has a constant-temperature room where these gages can be compared to make sure they are the same. Indicator gages, according to the speaker, are preferred to the fixed "go—no go" type for inspection, particularly on the production lines. Workmen do a better job because they see in which direction their errors are going and can correct tool adjustment accordingly. Experience has shown that this method is just as accurate. Routine checking of the gages of course is required to assure their accuracy.

Inspection always creates a salvage problem. Rejected material is observed and considered in three ways: first, the trouble is diagnosed, just as a doctor would a sick patient, to determine what is wrong and how to correct it; second, it is hospitalized, to see if it can be saved and restored to production, and last, it goes to the undertaker, who disposes of it to the best advantage. In other words, a good salvage department should prevent waste and improve scrap material utilization. Proper preparation or segregation of waste material may greatly increase the dollar value. Frequently it can be reworked and used in an entirely different way, thus changing loss into a profit.

Non-Production Job

At La Grange, the inspection department has other than production problems. They have to check customer repair work and determine what to scrap and what to repair or recondition. This is a different kind of receiving inspection but a very vital one to both the company and the customer. It involves customer "good will" in its broadest sense.

"Don't compound a felony," Mr. Jacoby concluded, "by allowing defective or scrap parts to get into any assembly."

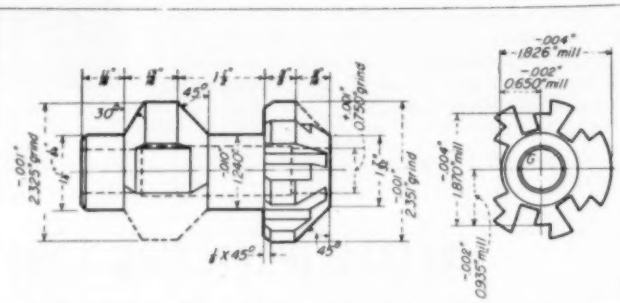
HSS, PLUS HIGH ANGLES,

Have carbides been adopted so fast that full possibilities of HSS have not been realized? Recent experiments, here reported, indicate such a possibility, because "impossible" speeds have been attained with reground scrap cutters

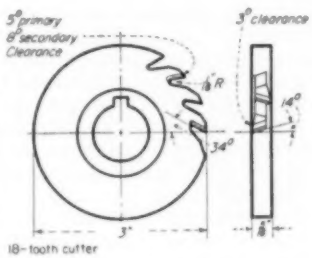
BY WALDEN F. SINAWSKI
Cutting Tool Engineer,
JONES & LAMSON MACHINE COMPANY

FIRST carbide cutting tools came into industry generally in the form of turning tools. Properties of the cemented carbides, such as the very high "red" or "hot" hardness and the high compression strength (in the vicinity of 700,000 psi), made turning one of their most practical applications. The transverse rupture strength was low, but this was overcome by brazing the carbide tip into a suitable shank material. More difficult applications, such as milling, were next undertaken. These require use of new grades of carbide, and the industry developed grades which are now being used with remarkable success on materials such as cast iron, but are a litte more difficult to apply on steel.

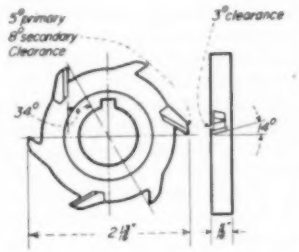
The advance of the carbides has been so rapid, that it seems we did not explore the possibilities of high-speed steel cutting tools to their fullest extent, particularly HSS milling cutters. We have in recent months been experimenting, as have others, with high-angle milling in the interest of economy. By high-angle milling is meant rake angles considerably in excess of what were commonly thought of as maximums. These high angles are radial rake angles in the vicinity of 30° positive. We have used these high angles in conjunction with the standard helix angles of about 14° on staggered-tooth slotting cutters and helix angles as high as 45° on other applications. We have used such cutters on slot milling, slab or plain milling and form milling with results that compare favorably with carbide cutters on some applications. Three typical cases are shown here.



SLOTTING—For the single-lever feed-selector housing on a Jones & Lamson turret lathe, this cam of X-1315 is to be slotted on the periphery. A latest-type high-production carbide cutter at 500 rpm and 26-ipm feed, run dry on a 50-hp CSM Cincinnati miller, failed after 307 cuts. Finish after one cut per step would not pass inspection, and heat from chips, close to the work during indexing and cutting, was too great to permit maintenance of the 0.002-in. tolerance. Of course, nature of the work and the indexing fixture, and necessary distance between arbor supports on the 1-in. arbor, make this not an ideal carbide application. A high-angle HSS cutter proved comparable in feed and life on a practical basis

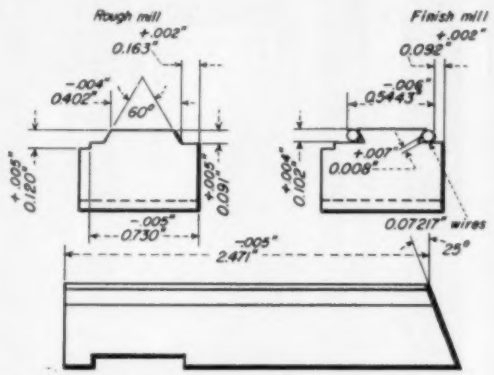


First HA Cutter—A standard 3-in.-dia, 5/16-in.-wide staggered-tooth HSS slotting cutter was reworked for the cam job. A double 1/16-in. radius was put in the gullet because of the chip action. There is very little chip distortion, chips come off with practically no increase in thickness over the feed per tooth used, thus use the full length of the arc of contact of the cutter. The radius next to the tooth face curls the chip and prevents loading. The cutter was run at 344 rpm with 18-ipm feed; this is 245 sfpm and 0.0029 to 0.0058 in. per tooth chip load. After 741 cuts, there was less than 0.008-in. wear land on the cutter periphery, almost none on the sides.

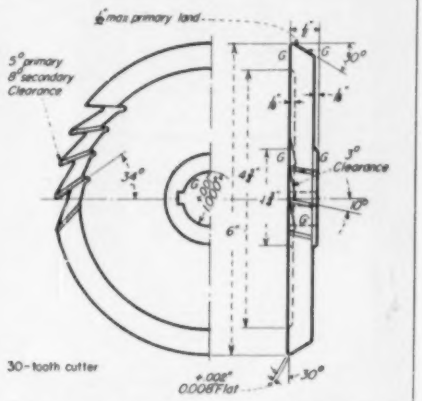


Modified Design—Apparently better results have been attained on X-1315 with this cutter, utilizing Vasco Supreme and running at 757 rpm and 26-ipm feed, about 560 sfpm and 0.0057 to 0.0114 in. per tooth chip load. Feed could be increased by adding teeth. The original cutter for this job was HSS, running at 157 rpm and 3½-ipm feed on deep cuts and 4¼-ipm feed on shallow ones, so speed has been increased 380%, feed 640% over the original

MILLS LIKE CARBIDE



FORM MILLING — This job is on dovetails in chasers for J & L tangent dieheads. Chasers are made from a high-grade HSS with a machinability rating of about 30%. A special indexing fixture holds one set (4 chasers) per load at a 30° angle. Stock removal is not very great, but the sharp corner that must be held has made cutter life short. Cutter life, with conventional grinds, with conventional speeds and 7.5-ipm feed, averaged about 200 pieces (50 sets) per grind before the sharp corner was lost



High-Angle Form Cutter—A used HSS cutter was ground to this contour. At 119-rpm spindle speed and 20-ipm feed (top on the available miller), speed is 187 sfpm and chip load 0.005 in. per tooth. (Higher speed is not used because chip load is light enough as it is). Cutter life per grind increased to 1336 pieces (334 sets) maximum and 1000 pieces average. Coolant is a sulfur-base oil

SLAB OR PLAIN MILLING

The cutter on the slab or plain milling production job is a 3¼-in. dia 10-tooth plain milling cutter with a 30° radial rake and a 35° helix. The material is flat stock, SAE 1020, with a machinability rating of about 72% of SAE 1112. This is machined on the 50-hp CSM miller used for slotting also. Depth of cut on this is ⅛ in., width of cut 1¾ in. The work is 22 in. long. This job is run at 500 rpm and 60-ipm feed (this being the highest feed obtainable on this machine), which converts into 425 sfpm and a 0.012-in. per tooth chip load. This cutter is of regular HSS and was ground to the angles described by a tool salvage company. It was salvaged from a used slab milling cutter (which accounts for the small diameter and large number of teeth).

The complete cycle time (floor-to-floor) comparison for this operation, according to the standards used on production, allowing for cutter overtravel, is: high-angle slab-milling cutter—3.70 standard minutes, conventional slab-milling cutter—8.90 standard minutes, 4-in.-dia 4-tooth carbide face-milling cutter—5.30 standard minutes.

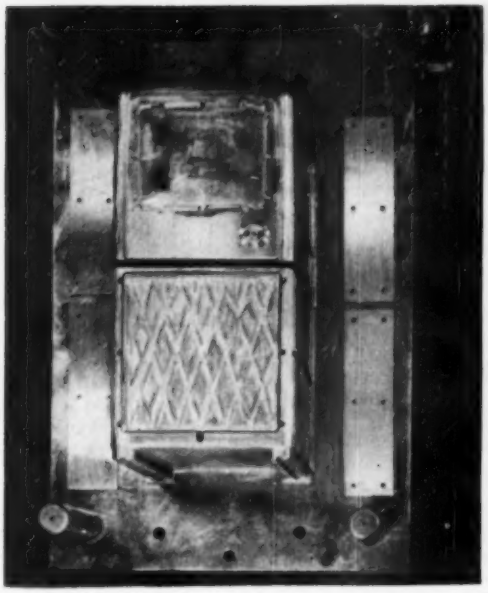
This same cutter has run more than 80 cuts on tests using the same feed and speed of 500 rpm and 60 ipm on SAE 1020 steel blocks, 4 in. wide and 5 in. long with from 1/16- to ⅛-in. stock removal. Coolant on these operations was a soluble oil, mixed according to specifications for general-purpose use. Chips come off very clean and with no discoloration or appreciable amount of heat. On the slab-milling application, a single ½-in. pipe supplied coolant. It was directed at the point of contact of cutter and work. These particular applications were all climb or down milling primarily because of better conditions for applying the coolant, the cutter acting similar to a pump gear at the higher spindle speeds, and to get the chips out of the way.

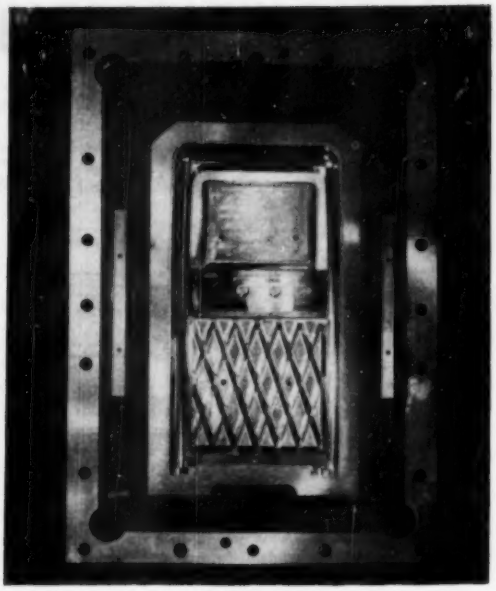
It seems apparent that the high angles used in connection with milling steel have definite possibilities. The cutters are no harder to service than ordinary HSS cutters. They require no special grinding wheels or equipment. They can be made from old or worn-out cutters at little expense. Power requirements should not be as great, although we have no definite data to substantiate this.

Other Applications

We have also tried these high angles on continuous-chip applications such as turning, but here results were poor because of inability to keep the cutting edge cool enough. The higher angles work with some success on cutting-off tools where the surface speed reduces rapidly and the coolant is confined to a certain extent in the slot formed by the tool.

While high-angle HSS tools will certainly not replace carbide tools, they will perform as well on some applications and certainly should bridge the gap between materials.





Molds—Steam-heated mold produces largest commercial one-piece product made to date from thermosetting plastic molding compound. Dies operate in 2000-ton hydraulic press and turn out 35-lb television cabinets for Admiral Corporation at rate of 10 per hr. Because of its size, mold cavity was finished by polishing with diamond abrasive rather than by chrome plating. Further experience may result in extended application of diamond abrasive

DIAMOND ABRASIVES FINISH HUGE MOLDS

Polishing with diamond compound saves many hours of die-finishing time and, at the same time, removes all blemishes from the mold surface, thereby insuring a high-quality finish on the product

BY D. R. SIRAGUSA
President
MOLDED PRODUCTS CORPORATION

LARGEST commercial one-piece plastic molding made to date is the 35-lb cabinet made by Molded Products Corporation for Admiral Corporation's new 10-in. television receiver. Compression molded from recently developed long-draw phenolic molding compounds, this cabinet is produced in molds that required nearly a year of careful engineering, planning, and diemaking.

To achieve high operating temperatures needed for the thermosetting phenolic compounds, each mold section is drilled with a network of steam lines. High-pressure steam at 320 F is fed through this network continuously, and molding compound, in preformed briquets, is heated to 175 F electronically before being placed in the mold. Design of the mold also includes automatically actuated side cores that provide molded-in mounting holes in the center and bottom shelves, thereby reducing molding-cycle time. Because of preheating and other special molding procedures, two men with one 2000-ton press now turn out 10 cabinets an hour, while it is estimated that by ordinary methods the cabinet would have required 20-min molding time in a 4000-ton press.

The completed mold weighs 16,000 lb and consists of seven major parts, each machined from a forged block of Crucible CSM-2 tool steel. Each forging must be flawless to prevent splitting or cracking of the finished mold during molding. After inspection, each forging was machined, polished, hardened by carburizing, and then finely finished before assembly. To insure accuracy in assembly, the seven parts were finished in sequence, fitting each to its mating piece as

Final Polishing — Final finish on cavity walls is achieved with 1200 grit diamond compound in synthetic carrier, plus rotating bob on right-angle flexible-shaft drive head. Quality of this finish is reproduced on cabinet, so extreme care is needed to remove all blemishes or imperfections

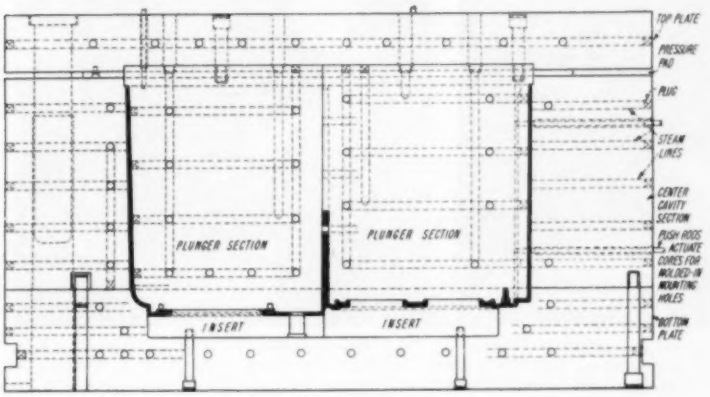
the part reached assembly stage.

The mold cavity was finished by polishing with diamond abrasive compound, rather than by chrome plating, the usual procedure. It was feared that expansion of the mold, caused by heating with steam at 320 F, would cause the chrome plate to spall and flake. Polishing with diamond compound produced a higher luster than would have been possible with other finishing methods. The color is darker than would have been obtained with chrome plate, but results in an entirely satisfactory color on the workpieces. In addition, by leaving 0.003 to 0.005 in. on the cavity surfaces for removal by polishing after carburizing, all of the decarburized skin was removed, leaving the toughest possible surface to resist molding wear and erosion. In fact, after 25,000 cabinets had been produced there was no sign of erosion or wear anywhere inside the cavity, on the faces of the inserts in the bottom die, or on the plungers.

Plunger sections on the upper platen are left slightly rough, with polish lines at right angles to the direction of ram movement. Thus the molding sticks to the plungers as the mold opens. At a fixed point as the ram ascends, a mechanical knockout strips the cabinet from the plunger. Removal must be accomplished quickly, because the cabinet shrinks as it cools and might bind tightly to the plungers. To facilitate quick removal, a draft of 0.005 in. per inch of depth was machined and polished in the cavity and on the plunger sections.

The machining, hardening, and polishing sequence for each mold section follows: (1) Rough and finish machine. (2) Grind, file, and scrape cavity surfaces and mating fit surfaces. (3) Rough polish cavity and plunger surfaces with No. 60 grit aluminum oxide stones and emery cloth. (4) Harden to 56 to 58 Rockwell C by carburizing in bone-charcoal. (5) Polish about 0.003 to 0.005 in. from all molding surfaces by following the procedure outlined below:

(A) Remove scale from hardened



Design of Mold — Seven main sections are assembled to make mold for Admiral Television cabinet. Each is machined from solid forging of CSM-2 tool steel. Top and bottom plates, large center cavity sections, and two plunger sections are drilled with network of steam lines so mold temperature can be maintained above 300 F for thermosetting phenolic molding compound. The two inserts in bottom die can be interchanged with other inserts should design change

Rough Polishing—Sidewalls of mold cavity are "rough" polished in a series of six stoning operations using progressively finer aluminum oxide stones

Semi-finish Polishing—Power tool oscillates felt pads charged with loose emery to semi-finish cavity walls. Pads are mounted on Sterling 1000 polisher and operated at 5000 oscillations per min

surfaces with full-strength muriatic acid. The acid is applied by brush, is left on the surface for 2 to 3 min so it can eat through the scale, then is washed off with clear water.

(B) **Stone all mold-cavity plunger surfaces with No. 36 grit aluminum oxide stones.** A special reciprocating holder operated by a flexible shaft drive was developed by Molded Products diemakers for stoning the flat surfaces; the radii and contours are stoned by hand. Surfaces then are repolished successively with stones of No. 120, 240 and 320 grit, respectively, with kerosene as the lubricant.

(C) **Repolish cavity surfaces with emery cloth and kerosene,** using successively No. 120, No. 240, and No. 320 grit. Wherever possible, polishing is done with an oscillating machine with felt backup pads.

(D) **Work loose emery powder over the surfaces with balsa wood blocks.** Grit sizes are No. 240, No. 320 and No. 400 successively, and kerosene is the lubricant. Final polishing is done in the direction of the mold draw so the cabinet will not "hold" in the cavity when the plungers are withdrawn.

(E) **Charge loose emery powder in felt pads and dry polish with the oscillating polisher,** and No. 400, 500 and 600 grits, successively.

(F) **Finish polish the cavity surfaces with 1200-grit diamond compound, using a soft felt disk bob on a flexible-shaft polishing head.** In this final operation, the die finisher must go over every square inch of the cavity surfaces with eagle-eyed concentration. The slightest blemish will be reproduced in the molded part. Very little diamond compound is necessary, as the surfaces already have been brought to a high polish by the preceding operations.

Only the cavity and bottom die-insert mold faces are so finely polished. Plunger surfaces are finished by polishing with No. 120 grit emery cloth, as in paragraph *C* above, so the cabinet will stick slightly for stripping from the plunger at the end of the thermosetting cycle.

Many hours of cavity polishing time were saved by using the relatively expensive diamond abrasive polishing compound, so the extra expense of this material was easily justified. Further experience with this material may result in its extended use, with consequent reduction in the number of preceding stoning and other abrasive polishing operations.

In operation, the mold has been so successful that another has been produced and placed in operation on a second press. The recess of these molds indicates the possibility of large housings as a new field for plastics.

Weighing and Preheating—Each charge of preformed briquets of molding compound is weighed, then preheated to 175 F in 15-kw high-frequency electronic unit. Preheating halves molding time

Trimming Flash—Press operator strips flash from all molded openings with specially shaped steel punches while cabinet is still hot

WHY WORK?

BY HAROLD J. ASHE, Compton, Calif.

AGAIN, from two separate sources, comes the proposal that workers be paid, in some instances, as much for not working as for putting in a full 40 hours. In other cases, more! The first proposal was about two years ago, before a Congressional committee on unemployment benefits. It suggested that minimum benefits be sharply increased in the lower brackets so that, in effect, they would approximate earned wages. One employer caustically questioned: "If we pay the unemployed these proposed benefits, how much must we pay them to work?"

Now, a Western Senator has introduced a bill that would guarantee to every unemployed worker 85% of his regular weekly earnings until he is able to secure another job. Also, the CIO proposes changing from the present state benefit plans which average, nationally, slightly under $25 per week for 23 weeks to an over-all basis. This, they say, should be scaled up to from 60% of normal wage for single workers to as much as 85% for those married, depending upon the size of families or number of beneficiaries.

On the surface, 85% appears to be 15% less than the unemployed worker could earn at gainful work. Actually the person would receive the same amount, and sometimes more, than his net earnings from employment. First, unemployment benefits are not subject to state or federal income tax, social security, or unemployment insurance deductions. Then, of course, there is no job expense such as transportation, work clothing, or in the case of clerical or office help, wearing apparel suitable to an appearance consistent with duties.

Consider a typical employee earning $50 per week for 40 hours and working 50 weeks per year. His gross wage is $2500. Examine a conservative estimate of net pay:

GROSS WAGES	$2500
Additional cost of work clothing	$40
Laundry & Drycleaning, same	$50
Social Security	$25
Unemployment Insurance	$25
Transportation at $2.50 per wk.	$125
Cost of meals over cost at home	$125
Total Expense	$390
Income Tax—Single Employee	$276
Net Income	$1834
Single Worker Unemployment Benefits—52 wk at $30 per wk	$1560
Incentive to work	$274

Those with families sufficiently large to permit drawing the full 85% benefit—even though they need pay no income tax—would receive $2125 unemployment benefit. Earned income would have been $2110 ($2500 less $310). *$15 cash inducement to stay home!*

Who Pays?

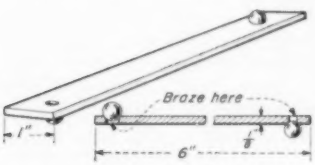
Proponents say this money "should come entirely from employers and from general revenues, with no taxes on workers." Actually, the public, including employed workers, will foot the bill, provided employers *can* pass the cost on. The latter has become rather difficult to do. It would surely mean lower wages and/or increased product cost all along the line.

The American economy is gravely endangered by such proposed laws. Incentive to produce is destroyed as the spread between benefits and earned wages decreases. Inducements, such as the proposed bills offer, give the employee a genuine *incentive* to seek firing and, if all else fails, accomplish this worthy objective by refusing to produce when he is on the job.

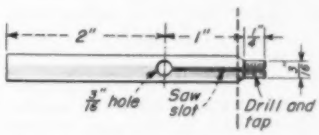
'Who, in his right mind, will work —with a law such as this, on the Federal statute books, to protect his idleness?

Short Cuts FOR THE SMALL SHOP

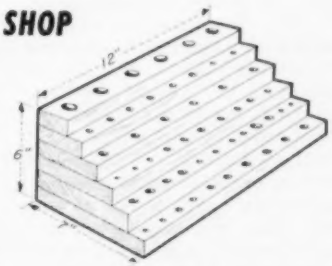
BY CHARLES L. LEEPER



GASKET BOLT HOLES are cut easier with a suitable tool than by using a ball-pein hammer. To make the tool, drill and countersink a hole at each end of a steel bar. Lay the bar on a piece of wet asbestos, place a steel ball in one countersink and weld or braze. Turn the bar over and weld the second ball at the opposite end. The tool will cut a good, clean gasket hole.



A COLLET-CHUCK adaptor for threaded workpieces is made as follows: Chuck a piece of cold-rolled steel, drill and tap hole in one end. Saw a slot and drill a crosshole so the adaptor will grip like a collet, when the collet jaws are closed.



A COMPACT TOOLSTAND can be made from a tier of pine planks at very little cost. All pieces of wood should be 1 in. thick, except the top piece, which is 2 in. thick for larger tools. Mark tool sizes on the fronts of the steps to keep the stand in order. Then finish with clear shellac or varnish.

SEVEN STEPS IN

Starting an Apprentice Training Program

BY ROBERT B. CARMICHAEL
Supervisor of Apprentices
PRATT & WHITNEY DIV., NILES-BEMENT-POND CO.

OUR VARIOUS wartime training expedients were tolerated because, first, the larger lots permitted finer breakdowns of operations, thus making specialized training adequate; and secondly, because there wasn't time for broad training.

Under today's conditions, however, with smaller lots, with flexibility a prime necessity, and with a greater respect for dollars, many of us are suffering acutely from the lack of the "good, all 'round young man" such as we say "used to be on hand in the old days." Well, he was on hand in the old days because we made it our business, by formal or informal plan, to develop him. It's the one dependable way.

It's so easy for an executive to say, when approached on the subject, "I quite agree with you—I know we ought to have such a plan, but we haven't anyone in our plant with experience along that line and we'll have to put it off for the time being."

But that doesn't solve the problem; and the fact is that it isn't too difficult. Lack of personal experience isn't a great deterrent because the experience of others is available, in compact form, in a recently published booklet.*

The pattern has long since been established by companies, such as ours, which have had thorough training programs for years.

The plant need not be a large one, nor is the number of apprentices an indication of the plan's worth. In fact the small plant, with few apprentices, may find less difficulty in providing the required diversified training than the larger shops, with a comparatively larger number of apprentices, might have.

We must have more apprentice training, and in more shops, even if only in self defense. The training needs to be thorough, embracing all of the basic operations and, as well, the use and understanding of a wide diversity of measuring instruments and methods. Thoroughness is imperative, as in no other way will the company and the apprentice benefit to the greatest extent.

* Apprentice Training Standards, National Machine Tool Builders' Association, 10525 Carnegie Ave., Cleveland 6, Ohio.

HOW TO START

1. Pick a minor executive to take charge of the training. Not too young—he must know, through experience, the class of work each apprentice is doing and its relative value in the over-all program. Not too old—he must be able to circulate among the boys frequently, to maintain contacts with the foremen and the school, and various other duties which call for physical activity on his part. And make up your mind to this: if you start a training program you cannot leave it alone—it won't run automatically.

2. Consult your Superintendent of Schools and explain your problem to him. You will need classroom work in certain subjects. Does he have classrooms that are available? Does he have the proper teachers available on an arrangement whereby they could be paid by your company, if necessary? Can he arrange not only to teach certain subjects but also to show their application to the trade involved? Is there a good trade school with part-time extension classes where such education is already established? Is there a college nearby that would cooperate? These are highly important points because apprentice training involves a substantial amount of classroom work.

3. With teaching arrangements and schedules established, and a general accord with your shop superintendent and his foremen, have the shop searched for prospective candidates who meet all the requirements, and make no exceptions. Pursue exactly the same course in the quest of candidates from outside the plant. Adherence to the stated requirements, to the thoroughness of training, and to the subsequent placement and promotion of your graduates, will, as time goes on, attract young men to your plant.

4. Prepare the necessary forms. These include the application for apprenticeship, the apprentice agreement, the conditions of apprenticeship, the foreman's report, the work record, the apprentice report, etc. You will find all these forms suggested in the aforementioned booklet.

5. Arrange the shop-work schedule of your apprentices to fit in properly with your shop operations on the one hand, and the classroom work on the other. In the machine-tool apprentice training course the required classroom work consists of not less than 144 hours for each 2000 hours in the

HELP WANTED

DEMONSTRATOR – MACHINIST – ENGINEER – PRODUCTION CONTROL MAN – SALESMAN – SUPERINTENDENT – FOREMAN – SERVICEMAN – TOOLMAKER

Applicant should be young, alert, ambitious; well trained in all basic machining operations; have a good knowledge of shop mathematics; have a good understanding of our company, our policies, and our methods of operation; have a suitable personality; have an aptitude for the job he is to fill. Apply at personnel office.

When you need a man, could you find one with these qualifications? You might be lucky and find one on the spur of the moment in your own plant or elsewhere. But the odds are against it unless you have prepared the way with an apprentice training program

shop, with subjects including blueprint reading, algebra, geometry, trigonometry, beginning physics, fundamental mechanical drawing, elemental metallurgy and heat treatment, civics, applied English, and various others, all of which are listed in the booklet. The shop work includes all the basic machine-shop operations, such as boring, drilling and tapping, grinding, milling, shaping and planing, turning, assembling, and understanding and use of a wide diversity of measuring tools that go along with such work.

6. Develop procedures for keeping current records on the various forms you decide to utilize—any significant lag in this matter may lead to unreliable records. A wall chart showing the progress of all apprentices from department to department can be a good checking point for other records. This should be in a place of easy access.

7. Set up a system to cover the costs of the program, including the fact that nearly all of the work done by apprentices will be used. In some plants an extra time allowance is made on the work order for the various stages of apprenticeship—a larger allowance for the early stage and less for succeeding stages. This increase in "allowed" time is charged against apprentice training— the remainder goes against the work order.

Time spent in classroom studies, for which the apprentice is paid at his regular rate, is charged against an account number set up for that purpose. Non-productive phases of shop work, not chargeable against a regular work order, are recorded against a special account number set up for that purpose and this latter can be used only upon special authorization. Cost of tool boxes and personal tools, part or all of which may be absorbed by the company, present no accounting difficulty. Some methods charge the apprentice supervisor's time as direct overhead while others include it in a general divisional or plant overhead. Some also make a breakdown of foremen's time, as a cost, based on the number of apprentice hours in his department during certain periods.

TWO POINTS OF CAUTION

1. *Occasionally some sections of management are tempted to place expediency on a higher plane than planned training.* For example, "freezing" an apprentice in an operation for which he has shown unusual aptitude. If the young man has been accepted as an apprentice such procedure would be short-sighted and unethical unless, by agreement, the contract had been canceled. Short-sighted because if he had satisfied all requirements and had been formally accepted he could, conceivably, have gone on through the years, to some highly important post instead of becoming and remaining a first-rate machine operator. Unethical, because a signed agreement would have been broken.

2. *Sometimes management neglects to plan sufficiently for placement of graduates, with the result that some of them are put into jobs without due consideration of their individual qualities,* but instead to meet the needs of a specific condition that is not commensurate with their training and capabilities.

With good records and proper over-all supervision, however, each apprentice's abilities, as observed and recorded, should be susceptible to a fairly accurate analysis *before* graduation and that should result in good placement of the graduate and a job well manned for the company.

To summarize: Given discerning selection of candidates, thorough training and adequate education, and considered placement upon graduation, it is certain that candidates for some, or all, of the jobs that arise in a plant will be on hand, as they have been in ours.

"We put the men on the line, instead of the assemblies. Wham! Up went production."

SWIVEL TOOL BORES PISTON CHAMBER

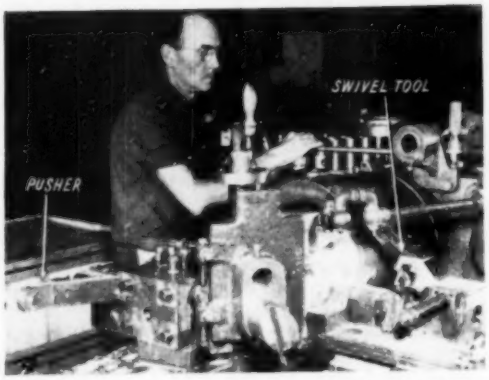
BY JOHN LUND, Superintendent
Manufacturing Equipment & Processes
JOHN DEERE WATERLOO TRACTOR WORKS

ALUMINUM alloy pistons made at John Deere Waterloo Tractor Works have a 3½-in.-dia explosion chamber bored in the head end. The opening into this chamber, when finish-bored, is only 1 11/16 in. in dia, which complicates the problem of precision contour boring. Further, production quantities do not justify special machine tools for the job. To lick this problem, John Deere developed a special swing boring tool that operates in a 4-step boring sequence on a standard No. 5 J & L turret lathe.

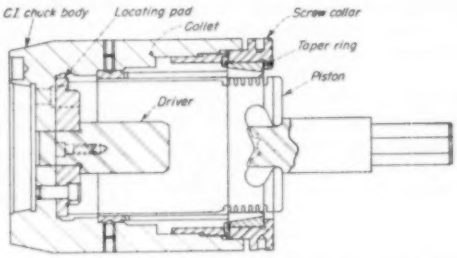
The first and second operations consist of removing the centering boss inside the chamber and of contouring the rise in the center of the chamber cavity. Originally these operations were performed with a standard two-flute twist drill and a special forming tool. Recent trials, however, have shown that the first roughing operation for removal of most of the boss is improved through use of a form tool almost identical with that for the second operation. Both tools are tipped with carbide, as is the special swing tool that rough and finish bores the chamber walls in the third operation.

The swing tool is mounted on the cross slide and is actuated by a pusher mounted on the third face of the hexagonal turret. The actuating arm that rotates the tool holder swings through 78° with a forward traverse of the pusher amounting to approximately 5 7/16 in. The arm thus moves from 47° behind center to 31° ahead of center as it swings the tool holder to its maximum position inside the chamber. The turret ram is fed at 0.011 ipr during the stroke, and the work is rotated at 243 rpm.

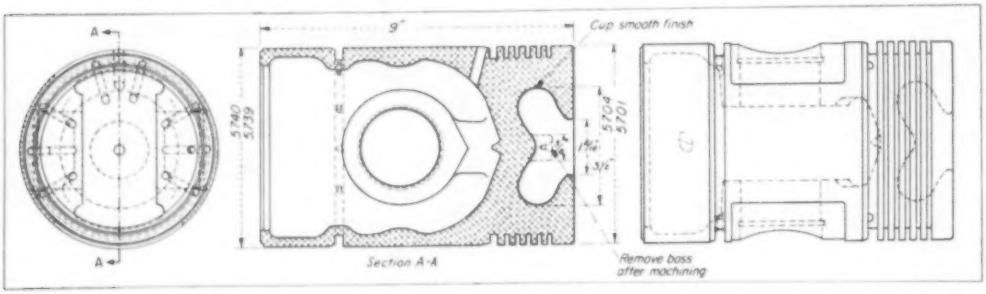
The fourth operation on the chamber is performed with a single-point, carbide-tipped bit held in a bar supported by a vertically adjustable slide on the turret. This tool blends the radii finished by the second form tool and by swivelling boring tool.



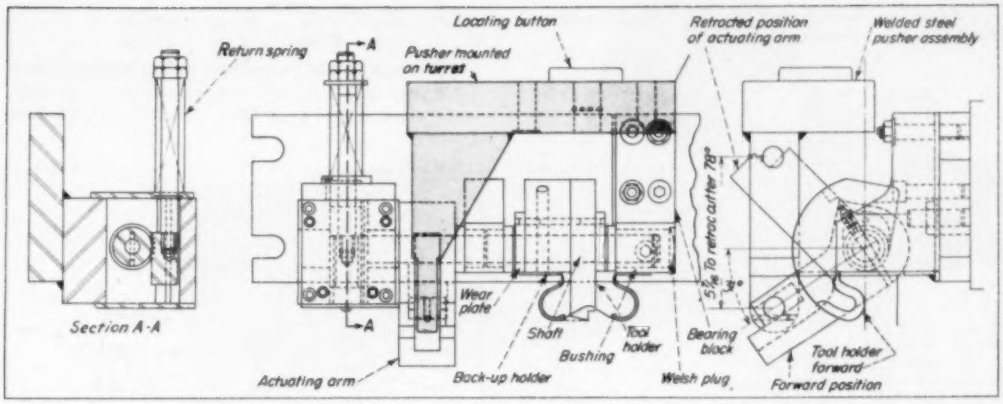
Swivel-mounted boring tool finishes explosion chamber in end of diesel piston. Tool is mounted on cross slide of No. 5 J & L turret lathe and is shown in out-of-the-way position at rear of machine. During boring, carriage is locked in position longitudinally and slide is adjusted transversely against stop to bring swing tool into position. Pusher on turret then is swung into position and is advanced to actuate tool for boring operation



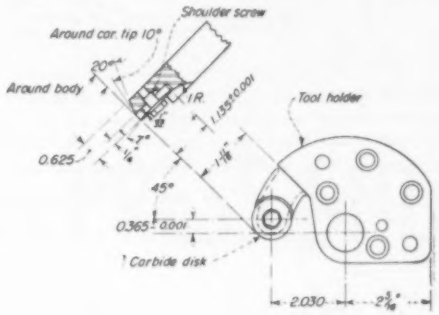
Pot chuck has large screw collar with taper ring at open end to close collet around machined periphery of piston. Work seats on hardened steel locating pad in bottom of collet chamber and driver engages interior of piston. Form tool is for second operation. Similar tool now performs first operation.



Cast aluminum-alloy piston has cored explosion chamber that must be finished after all operations requiring a head center have been completed, as boring removes center boss in chamber cavity. Boring sequence includes use of swivel tool. Castings have hardness of 85-115 Brinell, and weigh 10.25 lb when finished.



Swiveling tool is actuated by welded steel pusher bolted to turret. Carrier is bolted to backup block on cross shaft and pusher engages actuating arm on same shaft. Spring-loaded rack and gear on shaft maintain constant pressure against pusher. Center of rotation of tool is 1¾ in. below spindle center to give correct arc of travel to finish chamber



Tool holder has 1.135-in. solid carbide disk mounted on outer end with special shoulder screw. Disk is dished 1/32 in. on top face to provide a 7° back cutting edge angle. Periphery is tapered 10° for cutting clearance while holder body under disk has 20° clearance angle. Tool-steel body is hardened to 53-55 Rockwell C, and shoulder screw holding carbide disk is hardened to 46-48 R_c

SPECIAL HOB CUTS RADIAL V-GROOVES

BY WM. W. JOHNSON

TO PRODUCE the required ratio of spindle speed to work speed with a built-in drive for the dividing head, such as is provided on the Milwaukee mill, certain calculations are necessary. An accompanying illustration shows the gear train on such a machine. To determine the ratio of gears P and Q, it is found by trial that when the machine is set for a table feed of 5¾ in. and a spindle speed of 35 rpm, with change gears A=20T, B=38T, C=20T and D=40T, there will be 27 divisions on the work.

Therefore the ratio of the driveshaft is:

$$\frac{1\times 40\times \mathbf{A}\times \mathbf{C}}{\mathbf{B}\times \mathbf{D}} \quad \text{or} \quad \frac{40\times 20\times 20}{38\times 40} = \frac{200}{19}$$

Then the ratio of P and Q is:

$$\frac{27\times \mathbf{P}}{\mathbf{Q}} = \frac{200}{19} \quad \frac{\mathbf{P}}{\mathbf{Q}} = \frac{200}{19\times 27} = \frac{200}{513}$$

To find the ratio of the drive shaft for one turn of the dividing head:

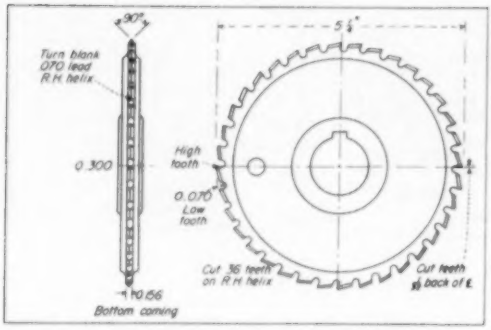
$$\frac{1\times 40\times \mathbf{A}\times \mathbf{C}}{\mathbf{B}\times \mathbf{D}} = \frac{40\times 20\times 20}{38\times 40} = \frac{200}{19}$$

To find the change gears for 34 turns of the cutter for one turn of the dividing head:

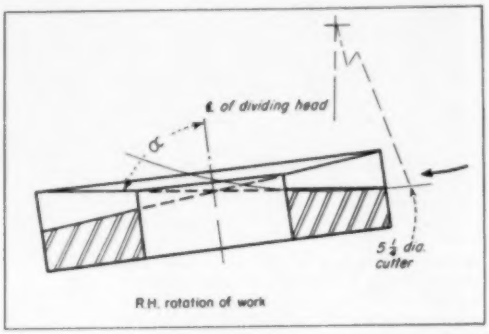
$$\frac{34\times200\times D\times B}{19\times27\times40\times C\times A} = 1 = \frac{34\times5\times D\times B}{19\times27\times C\times A}$$

Change gears $\frac{D\times B}{C\times A} = \frac{19\times27}{34\times5} = \frac{38\times27}{17\times20}$

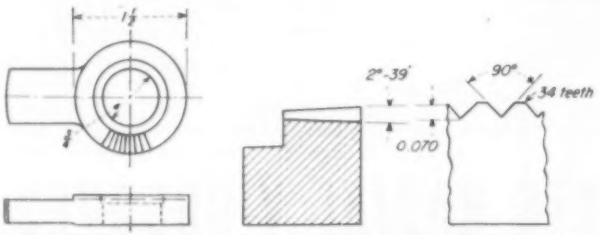
Therefore to mill 34 notches, set the machine for a table feed of 5¾ in. and a spindle speed of 35 rpm, with change gears: A=20T, B=27T, C=17T and D=38T.



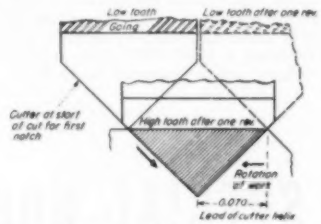
Helical form cutter for cutting V-grooves. Lead of the helix equals length of one-half the chord for one notch, or 0.070 in. Lead of the spiral equals depth of the notch, or 0.070 in. Feed per tooth is $\frac{0.070}{36} = 0.0019$ in., say 0.002 in.



Inclination of the dividing head is determined by the formula: $\sin \alpha = \tan \frac{90°}{N} \cot \frac{\psi}{2}$ where N = number of teeth and ψ = included angle of the cutter. Then $\sin \alpha = \tan \frac{90°}{34}$ $\cot \frac{90°}{2} = \tan 2° 38' 49'' \cot 45°$, and $\alpha = 87° 21'$

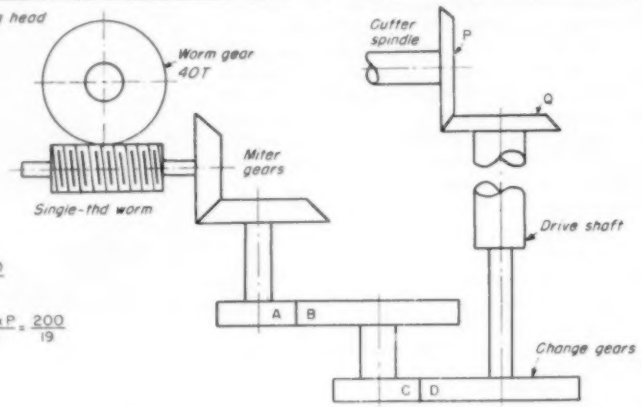


Adjusting ratchet for circular form tool, having 34 notches on ¾-in. radius. Chord = $2r \sin \frac{\psi}{2}$ and $\psi = \frac{360°}{34} = 10° 35' 18''$. Chord = 1.5 sin 5° 17' 39" = 1.5x-0.09227 = 0.1384, say 0.140 in. ½ chord = 0.070 in = depth of notch.


Low tooth Going
Low tooth after one rev.
Cutter at start of cut for first notch
High tooth after one rev.
Rotation of work
0.070
Lead of cutter helix

Cutter action during one revolution. Each tooth advances in succession, so one complete revolution finish-mills one notch. At 35 rpm, 1 part (34 notches) will require 58 sec

Gear train for operating dividing head spindle on a Milwaukee mill. Change gears must be selected to produce the desired number of divisions on the work



$\frac{1\times40\times A\times C}{B\times D}$ or $\frac{40\times20\times20}{38\times40} = \frac{200}{19}$

Then the ratio of P and Q is $\frac{27\times P}{Q} = \frac{200}{19}$

$\frac{P}{Q} = \frac{200}{19\times27} = \frac{200}{513}$

Plant Manager O. T. Hamby, who was previously master mechanic at Dodge, coordinated the design and layout of the Nine Mile Press Plant

How to obtain...

FLEXIBILITY in a PRESS SHOP

BY RUPERT LE GRAND, ASSOCIATE EDITOR

CHRYSLER Corporation has increased its metal-stamping capacity by approximately 25% through erection of the Nine Mile Press Plant just outside of Detroit. Although this 415,000-sq ft factory is engaged primarily in mass-production of automobile stampings, every precaution was taken to insure maximum flexibility in all phases of operation.

To avoid the rigidity of setup which the lay mind often associates with an auto-parts plant, many experienced Chrysler people worked together in order to achieve an ideal but thoroughly practical layout. The basic principles followed by these men can be adapted in whole or in part by others.

Many matters must be considered to obtain flexibility in a press shop. The first is stock handling—from the time it is received until finished parts or subassemblies leave the plant. Methods and equipment for producing blanks should be versatile and economical. Attention must be paid to adequate room for work in process. How presses are mounted, their accessibility for service and ease of rearrangement when products change—all these vitally affect current and future operating costs.

Effective use of presses is related to their ability to accept dies with little or no modifications. And the press room must be backed up with tool- and diemaking facilities able to make repairs promptly and to produce new tools as required.

This Special Report presents evidence of how Chrysler Corporation took these and other matters into consideration, so that the Nine Mile Press Plant can cope with existing and potential problems in manufacture of pressed-metal parts.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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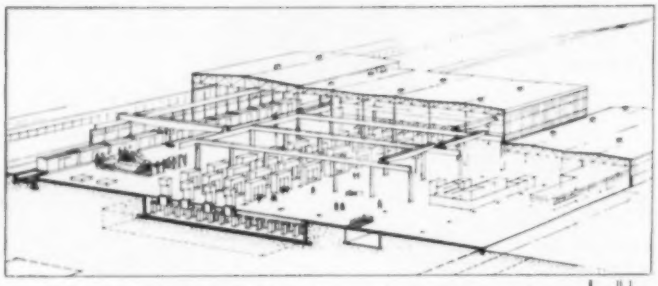


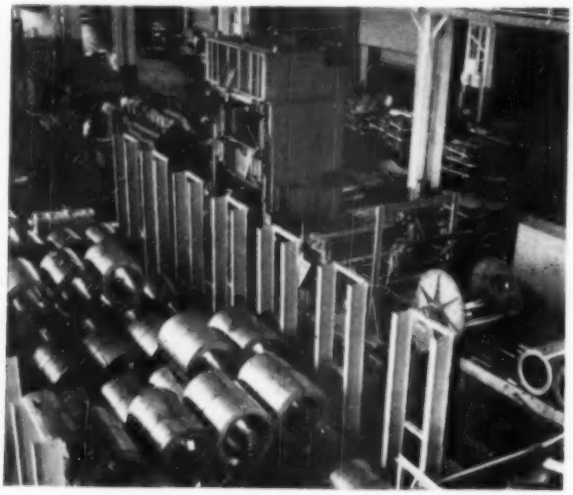
Chrysler's Nine Mile Press Plant produces major stampings and pressed-metal subassemblies. Presses are easily relocated, if necessary, to accommodate product changes. Heavy cranes serve the steel storage area and the 12 press lines

Good Stock Handling

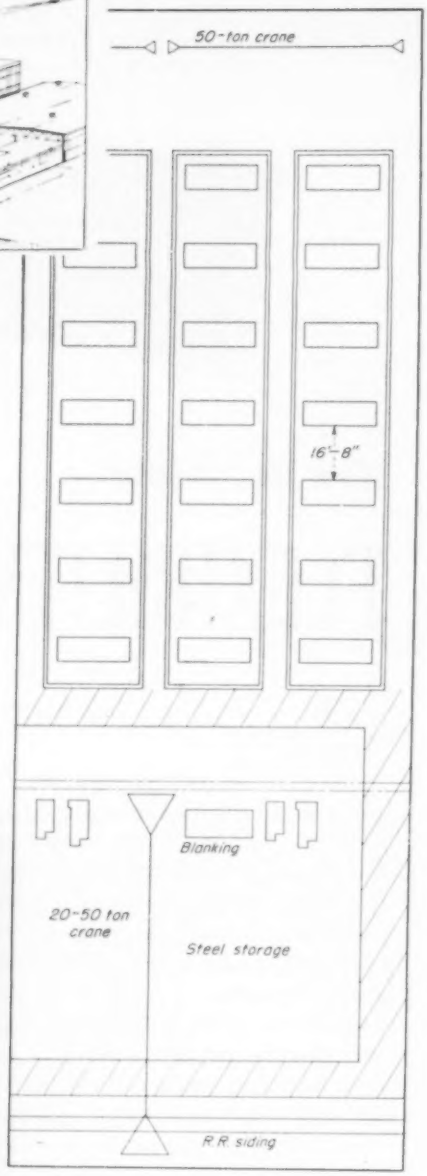
REQUIRES ROOM AND CRANES

CONGESTION is a common fault in press plants. Costs mount when inadequate room is provided for: (1) storage of steel, (2) blanking from strip or sheets, (3) roller leveling, (4) storage of parts in process between press operations, and (5) suitable handling during assembly. Perhaps the worst consequence of congested conditions is inability to re-arrange equipment lines or take on new jobs because space is inadequate for handling of the stock in an efficient manner.

To avoid the consequences of congestion, present or future, Chrysler engineers studied all types of press-plant construction, reviewed many floor layouts, charted work-



Racks for coiled strip are movable to provide aisle space where wanted. Large coils minimize coil crushing and waiting time at blanking press. Crane drops coils on ramp at coil cradle. Blanking press takes strip right to left or sheets front to back



Adequate space for stock storage and workhandling was specified by Chrysler engineers as a means of reducing costs, day by day, and to allow flexibility for changes in equipment layout or techniques as they arise. Fewer crane lifts are needed to remove steel from flat cars or position it for blanking or square shearing, because coils up to 15 tons or large bundles can be handled. Stock-preparation equipment is pushed as far under one craneway, as feasible, to provide maximum floor area for steel

ing-space dimensions that appealed to their experienced eyes. And they decided to have plenty of lifting capacity in cranes, and to cover the widest possible floor area by crane service.

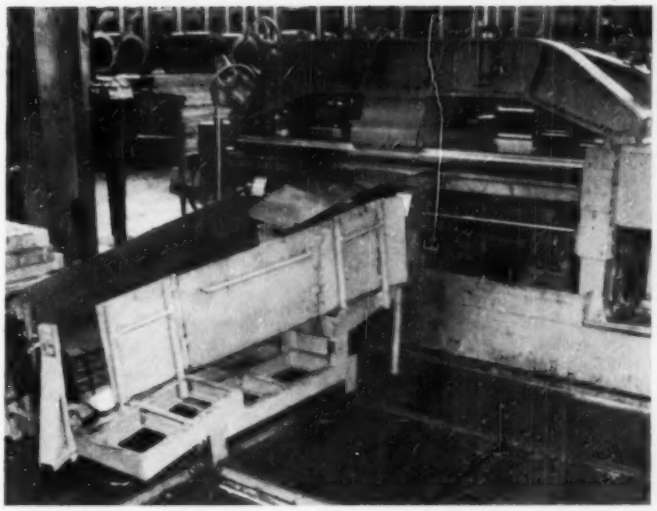
Material is stored in a bay 480 ft. long, and served by two 20-ton cranes and one combination 20-50 ton crane, all of approximately 100 ft. span. Width of storage area under the craneways is a maximum of 66 ft., not counting the railroad track and a 12-ft. aisle adjacent. Blanking presses and squaring shears are pushed as far as possible under one craneway, so that they intrude as little as possible on the stock-storage area.

Press lines are placed at right angles to the steel storage area, and are separated from the latter by an adequate aisle and storage area for blanks and squared sheets. Usual practice calls for placing a single row of presses between building columns spaced 20-25 ft. apart. Chrysler required 80 ft. between columns, placed two rows of presses in this span, surmounted it with a 50-ton crane for die handling, machine repair and transfer. Each press is therefore situated in a usable floor width of 36 ft.

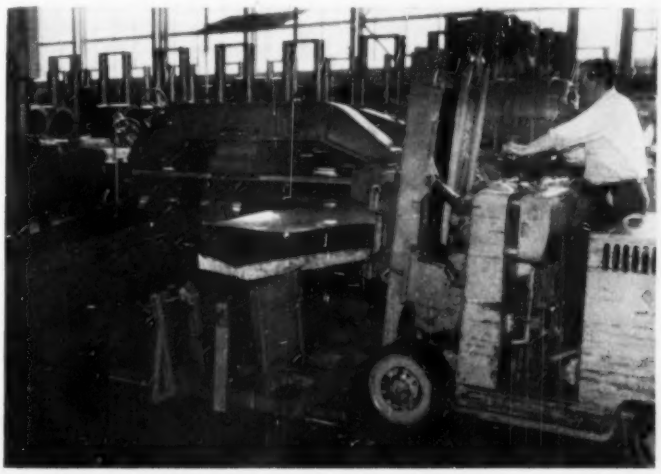
Room between presses is in the order of 16 ft. 8 in. This distance is ample for insertion of small presses in the line, when secondary operations arise, and for installation of slat conveyors, iron hands or automation equipment if needed. Also because of press spacing and width of press lines, there is plenty of space for stock boxes used for both parts and scrap. The scrap nests readily in double-size boxes, is transported more cheaply to the baler by lift truck than by dropping scrap through the floor.

Reasons for providing ample space around presses may be summarized thus:

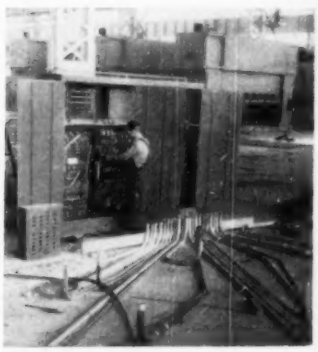
The 16 ft. 8 in. spacing between presses provides room to remove a panel from the rear of one press while another panel is being inserted in the next press. Auto roof panels are 6 ft. wide, including scrap. Hence 4 ft. 8 in. clearance is available while manipulating panels at adjacent sides of two presses. Also the 16 ft. 8 in. clearance space between presses is ample to permit turning a panel sideways to perform a secondary operation at an auxiliary press.



Blank catchers are used behind blanking press and also behind roller leveler, as shown. These blank catchers contribute greatly to plant efficiency. Roller leveler removes stretcher strains from blanks

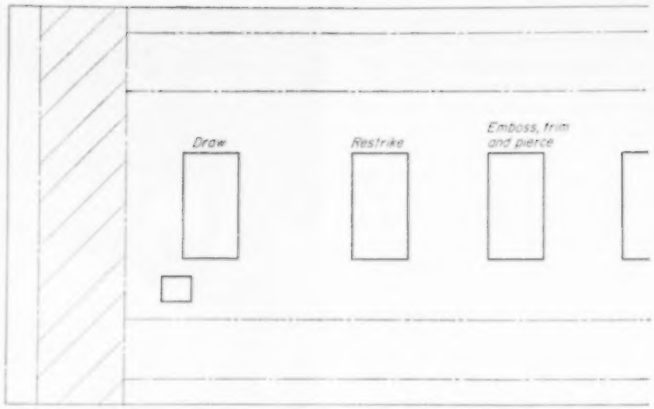


Wood pallets and blank catchers are made to blank outline. When full, the catcher is pushed to one side on rails provided. Lift-truck operator drops collapsible sides of catcher and removes pallet



Complex electrical installations are required for controlling the coil feed to huge blanking press. Careful preplanning of such installations is required for modern equipment

Lack of room for assembly operations at the end of press lines often compels press plants to transport stampings long distances or to other plants. The Nine Mile Press Plant has press lines 240 ft long, which is ample for assembly operations on major stampings and subassemblies. Production of door pillars for auto bodies involves making inner and outer panels, in rights and lefts, then incorporating a number of small reinforcements and hardware items by resistance welding. Skid boxes (dash outlines) in assembly areas indicate stock of small parts made elsewhere. Presses are wide enough to take dies for right and left-hand panels simultaneously



Press Lines

ARE ADAPTABLE TO VARIOUS JOBS

SINCE the Nine Mile Press Plant is designed to handle large automotive stampings, its press lines are equipped with machines of large die area and press capacity. Six of the twelve potential press lines start with a triple-action deep drawing press, which is followed by single-action presses of equal die space for restriking, piercing, flanging and trimming operations. Press widths, left to right, are 204, 180, 134 or 108 in., according to the line involved.

Flexible operation of these press lines is derived from a number of circumstances. In the first place, the tooling area of all presses is made to standard dimensions established by the Joint Industry Committee of the automotive industry (*AM*—April 21, 1949, p. 93). This means that die space and die-mounting details are standardized. Two of the larger press lines have capacity to make auto roof panels, if required, or it can be fitted with dies to make right- and left-hand panels for some other car part.

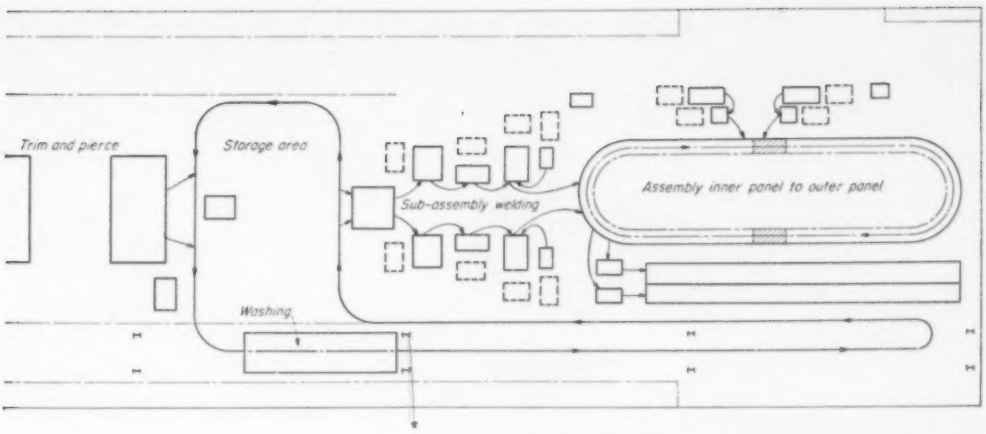
Take an actual case. Dies for rights and lefts had been mounted singly in 48-in. presses. But the tools for the two parts were put into 100-in. presses and shimmed up to ride level. Only change was to use standard pressure pins long enough to reach the pressure pad.

Since dies are made with mounting holes and pressure-pin holes according to the JIC standard dimensioning, the tools can be placed in the press and put into operation without cutting and fitting. And in case of a press breakdown, the tools can be transferred to another line.

It is to be supposed that most of the press lines will run through the model year on parts assigned specifically to them. But there may be occasions, when it will be desirable to run through say 60,000 sets of fenders for service parts. The relative ease of making die changes, as compared with conditions before development and adoption of the JIC standards, makes die changes feasible in what is funadamentally a production stamping plant.

When dies are pulled out of presses for storage, a section of the removable flooring is taken up. The overhead 50-ton crane serving each

Tooling space of all presses is built to standards adopted by the Joint Industry Committee of the automotive industry. **Hence,** all dies are readily mounted on the T-slotted bolster plate and ram face without reworking



double line of presses drops the die directly into the basement. Or if the dies are not of maximum size, they can be put on a heavy-duty die truck and taken into the basement by means of a ramp. In other words, dies can be placed in storage or taken out of storage quickly, so that minimum time is lost in getting a line into operation again.

Chrysler Corporation has a development of its own that avoids downtime on single-action presses. Instead of using say two large die cushions, twelve or more cushions standardized to 16 in. piston dia by 12 in. stroke are mounted in the press bed. If any cushion fails from trouble with valves, seals or piping, the extra capacity built into the cushions is such that any two cushions will take the load ordinarily spread over three cushions.

It is unlikely that all cushions will fail simultaneously, or even that any appreciable number will fail at once, except through failure of the air supply. The small cushions are readily removed and serviced, and in fact it is necessary to keep only a few in stock for replacement purposes.

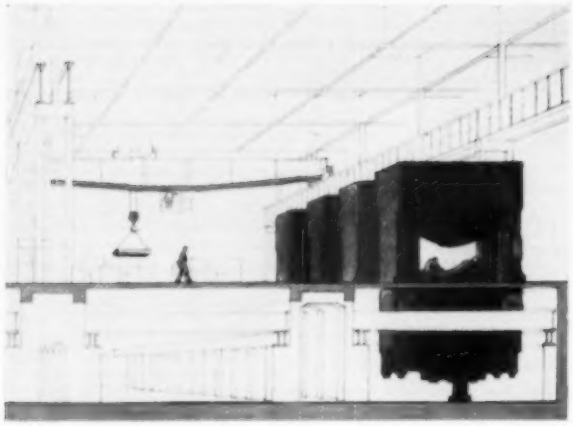
By using multiple die cushions, according to the Chrysler method, it is not necessary to synchronize dies when two of them are mounted in a press. If there were only one cushion and one pressure plate, both dies would be required to run in synchronism, or else take the risk of cocking the pressure plate. But with multiple cushions, two dies can run side by side in the same press, even if one is mounted on long pins and the other on short pins.

All presses are of the type with the main works above the floor. Connections are readily adjustable.

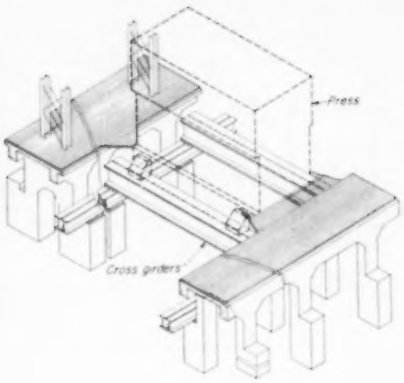
Presses can be moved closer together or farther apart or transported to other locations without preparing new foundations. Details of press support will be given on the following page. Nobody is particularly anxious to move large presses, even if the foundation scheme permits it. But one never knows when a serious re-arrangement of press lines or locations will be made necessary by product changes or shifts in manufacturing requirements. Hence, Chrysler did not overlook the desirability of having maximum flexibility with respect to press mounting.

The portable presses used for secondary operations are plugged into 440-volt outlets on building columns. Only one air line need be connected. These presses have an adequate flat base for stability and are easily picked up by the 50-ton crane and transported to another location.

Space between presses is ample to permit insertion of portable presses with ram-face area up to 36×48 in. Here two secondary operations on a fender are carried out with minimum handling



An open basement 17 ft. high gives ready access to die cushions and press connections. Plant rests on a 3-ft. thick concrete slab. Rows of concrete columns on 40-ft. centers have ledges mounting continuous double 24-in. steel girders



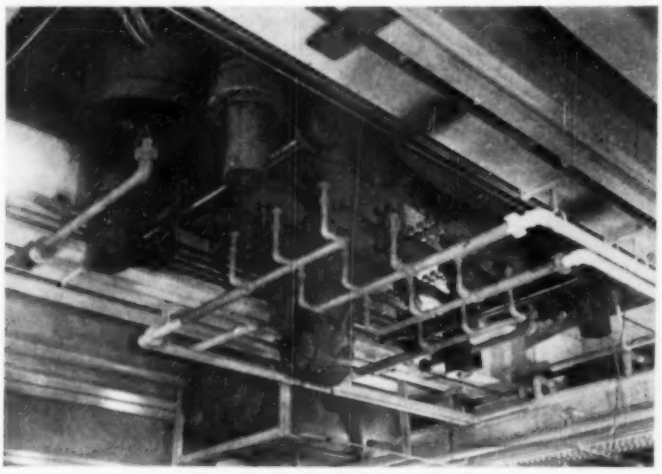
Press girders designed for 1,000,000 lb. load are secured anywhere along lower tier girders by anchor bolts. Top of press girders is 2 ft. 10 in. from floor

Flexibility in Press Transfer, Control and

IT MIGHT be supposed that once a press line is established, the layout will not be changed at some future date. But experience demonstrates that this assumption is often false. To avoid the extra expense and delays of preparing new foundations, various expedients like continuous foundations set into the ground are used.

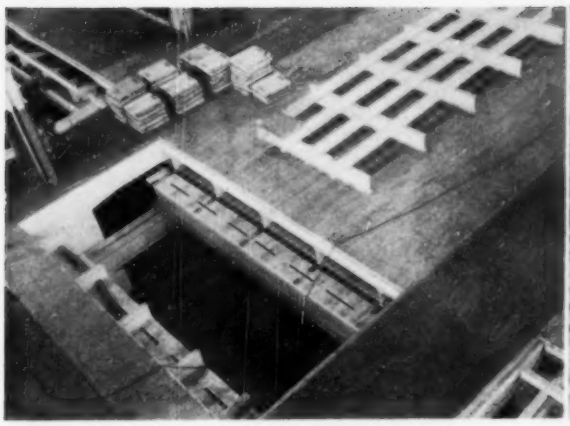
Chrysler went a long step farther by designing an open-basement press room. A concrete slab 3 ft. thick constitutes the basement floor, which acts as a pad to bear the entire weight of the structure and its equipment. Concrete basement columns and continuous tier beams for carrying the press girders are all alike. Columns are all spaced 40 ft. on centers. Hence the heaviest and largest press can be placed anywhere in the shop. The 50-ton cranes serving each pair of press lines have capacity to remove the heaviest components of presses to new locations, as dismantled, and without tedious delays.

An open basement under a press room, especially if it is not clut-



Adequate air supply to all die cushions is insured by step-down piping. Telephone jacks in basement and at press enable diesetters to communicate without running between floors or shouting into a pit

Blowdown of all presses in a line to a common **discharge** pipe terminating in a **muffler** avoids dirt and oil on the basement floor



Steel grids resting on press girders support the laminated-oak flooring sections. To drop a die into the basement or obtain a new opening for a press, the wood sections are taken up and the steel grid removed

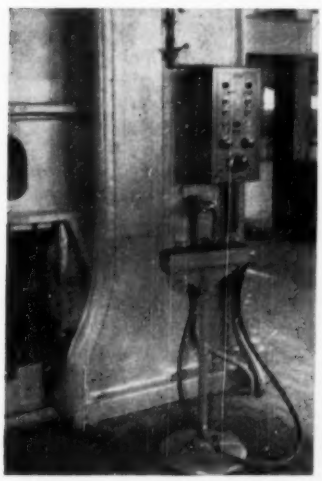
Flooring sections are 4 in. laminated oak. On the underside they have angle-iron spacers that position them on the steel flooring grids

Maintenance

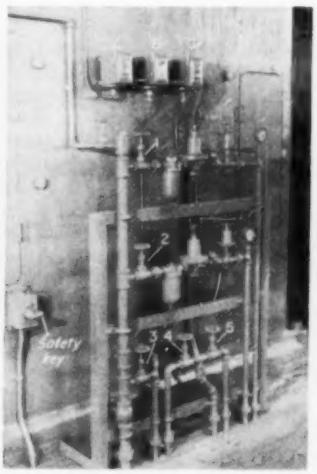
tered with press supports, has many day-by-day advantages. Inspection and maintenance of below-floor mechanism are simple because of accessibility. Portable scaffolds on rollers enable workers to get at their tasks with maximum ease, and have all necessary tools within arm's reach. One-shot lubricators on the basement columns can be operated by an oiler according to a timed sequence. Inactive dies can be stored out of the weather and are readily accessible when wanted.

To obtain a new "foundation" for a press, several easy steps are followed. First, the laminated oak squares that serve as the press-room floor are taken up. Then a floor-supporting steel grid is lifted out by crane. Now, the press support girders are exposed. These are spaced according to the distance between the press feet and rebolted to the tier beams below. The crane drops the press bed in position and the columns and crown are added in rapid sequence, compared to the usual schedule for erecting a press.

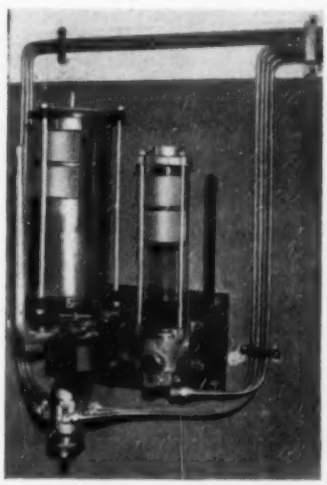
Convenience is stressed in repair of equipment and in die grinding and die setting, because of the importance of keeping nonproductive time at a minimum. On the press-room floor, 110-volt, 60- and 360-



Pedestal-type press control gives safety for operator or die-setter, and stops press motions to suit needs on a selective basis



Air-control valves for presses are grouped in standardized setup, so that die-setters avoid mistakes in applying air to press mechanism



One-shot lubricators on basement columns are operated by the oiler on a definite schedule. A feature is accessibility of the device

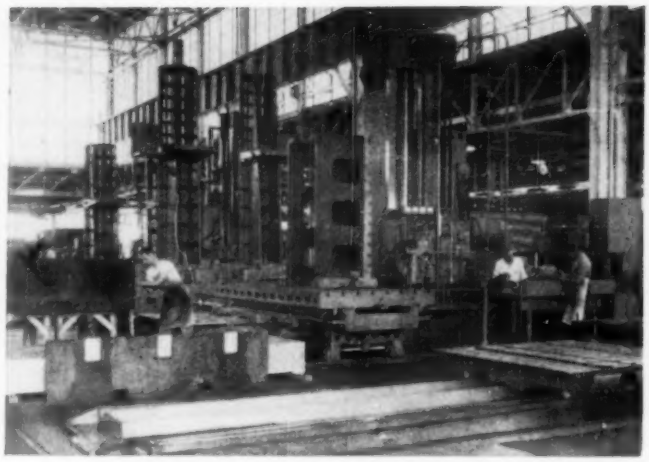
cycle outlets are located on columns for trouble lamps and portable die grinders. Telephone jacks on press-room floor and in the basement enable maintenance men to work together without lost time running between floors or attempting to pass verbal instructions above press-room noise. On the press-room floor are 440-volt receptacles for the purpose of plugging in the portable auxiliary presses often found necessary for secondary operations on panels while progressing down the line.

Safety Provisions

Safe, convenient control of presses means a great deal to satisfactory working conditions, and provides flexibility for quick repair of equipment or dies. Chrysler emphasizes safety in two controls upon which it has standardized. The first is a 3-button pedestal control used by press operator or maintenance man, the second is a system of air controls that prevents operation of the press if the main air supply fails or air does not properly reach the counterbalance or the holding brake for the slide.

The pedestal control is plugged in with a 12-wire cable, one wire grounded, and the press cannot be operated if the control is disconnected. One button disengages the clutch but does not stop the motor. The second button is used by maintenance men for an emergency stop of the motor, while the third stops the motor but does not apply the brake to the flywheel.

At the side of each press there is an air control system consisting of five handvalves and three diaphragm valves, the latter being connected into the electrical controls of the machine. Functions of the various components are (see illustration): Counterbalance—to apply air, open handvalve 1; to bleed, open 5. Pressure cylinder and die cushions—to apply air, open 2; to bleed, open 4. To apply air to holding brake for slide, open 4. Diaphragm valve *A* stops the press if the main air supply fails. Valve *B* stops the press if the air fails to the holding brake. Valve *C* stops the press and applies the flywheel emergency brake if the air fails to the counterbalance.



Main bay of toolroom is served by a 50-ton crane with 20-ton auxiliary winch. Machines in this bay have capacity to handle largest dies expected in automotive manufacture

Versatile Toolroom

SUPPORTS PRESS SHOP

THE TOOLROOM has plenty of capacity to handle repair work and new tools of infinite variety and size. Machine tools in the main bay have capacity to handle the largest roof dies and are served by a 50-ton crane with auxiliary 20-ton winch.

Machines in the main bay include: a double-housing planer to handle 75-ton loads and having an 18-ft. table travel, 10 ft. clearance between housings and 7 ft. under the crossrail. A planer-type miller with tubular ways has capacity to work on parts 18 ft. long, 10 ft. high and 8 ft. wide. Instead of using two die-duplicating machines with standard capacity for work 6 ft. high by 12 ft. wide, Chrysler required 7x14 ft. A smaller unit has 5x12 ft. capacity instead of standard 5x10 ft. Die tryout presses have widths of 124 and 192 in., respectively. Semicircular floor plates are used in connection with large radial drills, so work can be set up while another job is being machined.

A wide variety of machines are used in the low-bay section of the toolroom, which is served by five electric traveling hoists. To relieve the load on milling machines, all shapers have universal tables for greater freedom in setup, particularly in obtaining compound angles. Three vertical millers and three heavy-duty knee-type millers are employed for machining surfaces, also pockets for piercing punches and die retainers. To attain accuracy plus speed in machining holes in piercing dies, a jig-mill is used. Hole grinding up to 3 in. dia. is done on this machine by air-motor driven attachment with standard taper to fit in the jig-mill spindle.

A good many dies and checking fixtures are built onto boiler-plate bases. Very often the plate must be surfaced, and a planer cannot be tied up on this work at the height of the die-building season. Hence, a horizontal surface grinder with capacity of 36 in. transverse, 96 in. long and 30 in. vertical is installed, and also a rotary surface grinder to take 48 in. square by 36 in. high under the wheel. Small surface grinders are installed to grind small punches and die sections and to put shear on blanking-die sections.

What's cookin' in and around the Tool Show April 10-14.

FOR DETAILS OF NEW PRODUCTS TO BE SEEN CHECK *"THE SHOW IN PRINT"* PAGES 182-210, 270-282

STRAIGHT FROM DAVY JONES' LOCKER COMES A GUIDE ON WHERE TO EAT IN PHILADELPHIA

BY DAVID G. JONES
Philadelphia District Manager
AMERICAN MACHINIST

PHILADELPHIA sprawls for 20 miles from its northeast to its southeast corners, and is at certain places almost ten miles wide. To make a selection of "Where to Eat" most convenient for those out of town, we have divided suggestions into center city, Germantown, North Philadelphia, South Philadelphia, West Philadelphia and Philadelphia suburbs.

Philadelphia is divided into North and South Philadelphia by Market Street; into East and West by Broad Street, which is equivalent to 14th Street. These two streets intersect at City Hall, which makes this the practical center of the city.

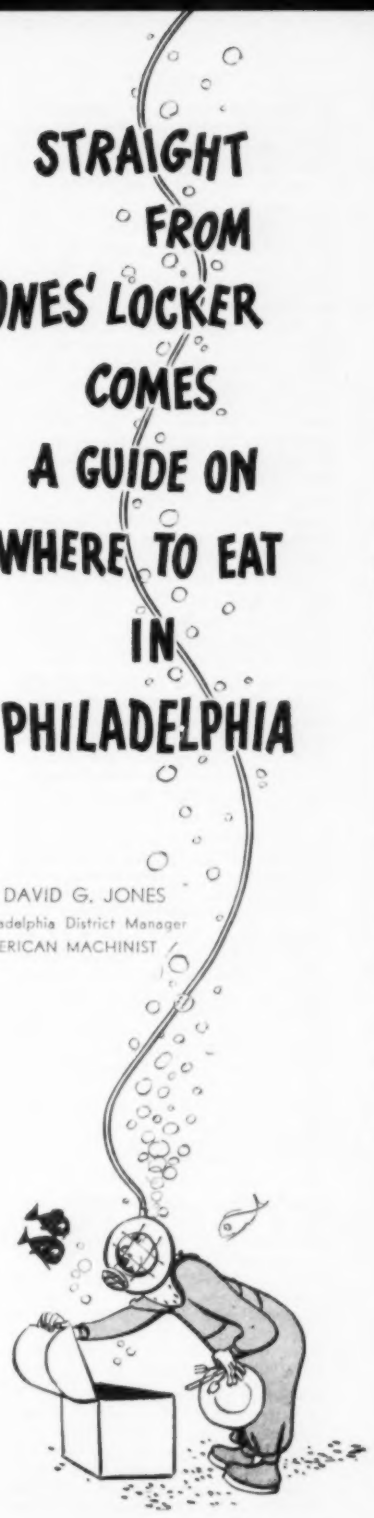
The Tool Show will be held at Convention Hall, just outside of the center-city area, across the Schuylkill River in West Philadelphia, but most of the hotel accommodations will be in city center.

All of these restaurants serve good food and are fairly priced. Reservations should not be necessary, except at some suburban restaurants where facilities are limited. Nevertheless, if the hour should be late, it is ofttimes well to phone and make sure that your party can be accommodated.

Some conventioneers plan a weekend at Atlantic City before or after the Show, and others plan to drive, so restaurant selections well out into the suburbs are included, as well as three at Atlantic City, which is 65 miles from Philadelphia City Hall.

For the chosen few, the best and most enjoyable place to eat in Philadelphia is not in Philadelphia at all, but across the river in New Jersey, at Damar Farm. There the atmosphere is quiet and congenial, for the Dutch Colonial brick house is set on a knoll amid broad acres of rolling farmland. It has a modern kitchen and other facilities, combining the charm of a century and more ago with the best our age has to offer. There "Davy" Jones has a legendary locker, but it's for frozen-food delicacies, not for lost sailors.

Must be known here; the owner keeps a dog. Best be acquainted with the cook, too, who here, as at Stouffer's, is a woman. Her first name is Marian; her last—you guessed it—is Jones. The owner, called Squire Jones, seems to be at the farm weekends mostly—has a selling job on *American Machinist* that keeps him busy weekdays. But these pages and this photo attest his capabilities when a good meal is set before him.



Center City

Acropolis Restaurant, 1018 Locust St. Authentic Greek menu. You may not know what to order but courteous waiters will help, and the food is delicious. Open 11 am to 2 am.

Arthur's Steak House, 3rd at Chancellor. Market 7-8629. One of Philadelphia's oldest steak houses—known from Coast to Coast—with real Colonial swashbuckling atmosphere.

Barclay Hotel, 18th & Rittenhouse Square. Kingsley 5-0300. One of Philadelphia's most distinguished dining spots. Refined atmosphere in exclusive settings, specializing in Continental dishes and seafood. You owe it to yourself to try Joseph's special salad bowls and Shrimps Caesar, an "out-of-this-world" delicacy. Open 7 am to 10 pm.

Louis G. Bauerle Inc., 14 S. 15th. Locust 7-9967. Noted for snapper soup, Bauerle's dates back to the Gay Nineties. Entirely modernized. Dinners 5 pm to 9 pm. Supper to 1 am.

Beck's Cafe, 122 Walnut St., WA 2-5122. Famous for Bar B-Q clams, chicken pie, and rock fish. Located amid sites of early Philadelphia.

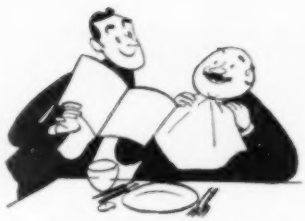
Bellevue-Stratford Hotel, Broad and Walnut Sts. **The Stratford Garden**—Bellevue's famous dining room. **The Burgundy Room**—Bellevue's good food in masculine environment. Ladies welcome. **The Coffee Shop**—popular-priced food, served quickly. Open 7 am to 1 am.

Benny the Bum's, 1321 Locust St. Kingsley 5-9708. Shrimp cocktail and broiled steaks are specialties at this intimate dining spot. A fresh vegetable condiment bowl adds zest.

Bookbinders, 125 Walnut St. Lombard 3-7028. The old original Bookbinders—famous the world over—has been awarded first place as America's most popular restaurant by Dartnell, world renowned connoisseur of food, and publisher of famous directory, "Where to Eat." For more than three-quarters of a century, Bookbinders has held steadfast in the heart of old Philadelphia. Seaford house. Full-course lobster dinners, seafood platter and à la carte. Open 11 am to 10:30 pm.

Bookbinder's Seafood House, Inc., 215 S. 15th St. Kingsley 5-0184. Owned and operated by members of the original Bookbinder family. Excellent seafood, chops, and steaks; fresh lobsters, steamed or broiled. Air-conditioned for comfort. A Philadelphia institution. Food prepared from special recipes in Bookbinder family for three generations.

Benjamin Franklin Hotel, 9th & Chestnut Sts. Walnut 2-8600. Excellent food served in pleasant surroundings, prepared by Lazarro Conti, chief de cuisine and supervised by Vincent Bruni. **Garden Terrace**—dinner 5:30 to 8:30 pm;



supper 9:00 pm to close; ice show 7:30 and 11:30; dancing from 7 pm; **Coral Cafe**—à la carte and table d'hôte service from 7 am to 8:30 pm; **Kite and Key Room**—smart cocktail lounge, open 11 am to 1 am.

Casway's Celebrity Room, 254 S. Juniper St. Pennypacker 5-6695. Attractive ultra-modern surroundings for good food with dancing and continuous entertainment. Excellent steaks, chops and Chicken Celebrity—a boneless chicken dish that wins praises. Luscious chef's salad. Open 7:30 pm to 2 am.

Cathay Tea Garden, 1221 Chestnut St. Spruce 4-4755. American and Chinese food. Specializing in Cantonese food and Chinese family dinners. Open 11 am to 1 am.

Drake Hotel, 1512 Spruce St. Kingsley 5-0100. If you are really hungry, try one of the planked-steak full-course dinners; you'll come away satisfied. Or order baked stuffed jumbo deviled crab with shoestring potatoes. If it isn't on the menu, Maître de Hôtel Michael will get it for you. **Drake Room** open for breakfast 7 am; dinner to 9:30 pm.

William L. Evans, Reading Terminal Market, 12th and Market Sts., Seafood and oyster bar. Market-fresh seafood. Open 9 am to 5 pm. A la carte service.

The Gimbel Restaurant, seventh floor Gimbel's store, 9th and Market Sts. Walnut 2-3300, Extension 710. Open 11 am to 3 pm except Wednesdays, 12 to 3 and 4 to 8 pm. Good food and handy for shoppers. Famous for its superb deviled crabs and fresh fruit salads, fresh the year 'round.

The Glass Door Restaurant, 254 S. 15th St. Pennypacker 5-9745. One of the most beautiful dining rooms in town, featuring ceramic - broiled steaks, chops, Maine lobsters and roast beef big enough for a Texan. Open 4 pm to 2 am.

Henri's Restaurant, 1330 Walnut St. Kingsley 5-3690. If you like fish, really fresh, try this place. Their restaurant at Cape May gives them the know-how. Steaks and lobsters too. Delicious onion and snapper soups, and for dessert, crepes Suzette. Open 11 am to 2 am.

Hespe's, 28 S. 16th St. Specializes in seafood and German dishes. You can almost always find a weiner schnitzel, knockwurst and wonderful goulash on the menu. 11 am to 1 am.

Homestead Restaurant, 1913 Walnut St. Rittenhouse 6-8380. If you are longing for a home-cooked meal, try this place, specializing in fried chicken . . . all you can eat . . . six relishes, four vegetables, with wide assortment of other dishes. Open 11:30 am to 2:30 pm for lunch, 4:30 to 8:30 pm for dinner.

Horn & Hardart's cafeterias and restaurants. Excellent low-priced food at many handy spots:

1321 Market—Automat Cafeteria 6 am to 1 am.

11th & Ludlow—Automat Cafeteria 7 am to 12 midnight.

106 S. 11th St.—Service restaurant 7 am to 8 pm.

101 S. Juniper—Service Restaurant and Automat Cafeteria, 8 am to 7 pm.

730 Market St.—Service Restaurant, 8 am to 1 am.

104 S. 8th St.—Service Restaurant and Cafeteria, 7 am to 4 pm.

219 S. Broad St.—Automat Cafeteria, 6 am to 12 midnight.

Broad & Chestnut Sts.—Service Restaurant, 7:30 am to 8 pm.

1429 Arch St.—Service Restaurant 6:30 am to midnight.

248 N. Broad St.—Automat Cafeteria, 6:45 am to 3 pm.

244 N. Broad St.—Service Restaurant, 7 am to 1 am.

26 N. 11th St.—Service Restaurant, open 24 hours.

1601 Chestnut St.—Service Restaurant and Automat Cafeteria, 7:30 am to 8:30 pm.

114 S. 18th St.—Service Restaurant, 7 am to 8 pm.

126 S. 4th St.—Service Restaurant, 8 am to 3 pm.

234 Market St.—Automat Cafeteria, 6:30 to 8 pm.

11th & Market Sts.—Automat Cafeteria, 7 am to 8 pm.

808 Arch St.—Automat Cafeteria, 6:30 am to 7 pm.

136 Market—Service Cafeteria, 24-hour service.

909 Market St.—Automat Cafeteria, 6:45 am to midnight.

432 Market St.—Cafeteria, 7 am to 7 pm.

339 Market St.—Automat Cafeteria, 6 am to midnight.

Holland's, 114 N. 19th St. A restaurant with family atmosphere, serving excellent southern cooking. Lunch 11 to 2 pm. Dinner 5 to 8 pm.

Kelly's, "The Original" famous oyster house, 9th St. above market. Walnut 2-9843. Unadorned setting for excellent food in old oyster house. Kelly's has been serving seafood, steaks, chops, and sandwiches since 1841.

Kelly's Oyster House, 5 S. Mole St. Locust 7-8398. Has been serving good seafood for 40 years. Be it lobster, crab meat or shrimp, the Newburg sauce is tops. Air-conditioned. Open Mon., Tues., and Thurs. 11 am to 9 pm; Wed. & Fri. 11 am to 12:30 am.

Kugler's Restaurant, Widener Bldg., 1330 Chestnut St. LO 7-2140. Kugler's is one of the more beautiful and impressive public restaurants in the land. There is also a large cocktail lounge and bar. Especially known for fine seafood. Prices reasonable for fine food. A la carte and table d'hôte service. Piano in cocktail lounge. Organ at dinner.

Lotus Garden, 120 S. 13th St., Philadelphia's newest Chinese eating spot. Delicious food. The genial host will suggest you try some of his specialties: Butterfly shrimp with bacon, Jar Guy Kew, Sang Guy Pan, Lobster Cantonese, or fried boneless chicken. Won Ton soup has a delicate, tantalizing flavor.

Panorama Room, 2601 Parkway. Poplar 5-1110. One of Philadelphia's newer restaurants in view of the Parkway. Five minutes from City Hall. Excellent cuisine, distinguished service; air-conditioned for comfort.

Russian Inn, 1233 Locust St. One of Philadelphia's most interesting restaurants. Famous for Continental dishes and superb American cuisine. Excellent Russian specialties. Luncheon 12 noon to 3:30 pm. Dinner 5 to 9:30. Supper to 1 am.

St. James Hotel Grill, 13th & Walnut Sts. Pennypacker 5-8400. Excellent food at moderate prices in congenial atmosphere. 7 am to 10 pm.

Shanghai Garden Restaurant, 919 Race St. Walnut 2-9993. In the heart of Philadelphia's Chinatown. Here you can get good Chinese food; egg, rolls, shrimp with lobster sauce, Lobster Cantonese, and Won Ton soup. Open 11 am to 2 am.

Sheraton Hotel, 19th & Walnut Sts. Rittenhouse 6-4800. Dining room overlooks historic Rittenhouse Square. American, Italian and French foods. 7:30 am to 8:40 pm.

Schraffts, 1216 Chestnut St. Kingsley 5-4156. Dining room, fountain, cocktails, men's grill. Good food at popular prices. Open 7:45 am to 8 pm.

Shoyer's, 412 Arch St. Market 7-8800. A favorite with famous folks of yesteryear, as well as today—in old Philadelphia near Ben Franklin's burial spot. 11:30 am to 8:30 pm.

Smorgasbord Restaurant, 1725 Spruce St. Kingsley 5-9006. An excellent place for Smorgasbord or a full-course meal. Open 5 to 9 pm.

Stouffer's, 1526 Chestnut St. Rittenhouse 6-4260. Also 215 S. Broad St. Kingsley 5-4260. Homelike food prepared by women cooks. Excellent drinks and cocktails. Men's tavern on S. Broad St., open at lunch time. Open 7:30 am to 12 midnight.

Tarello's, 1623 Chestnut St. Locust 7-9737. For Italian dishes, this is one of the best bets in town. Victor, as host, delights in a Continental atmosphere and delicious foods.

Lew Tendler's, 227-229 S. Broad St. Pennypacker 5-1802. Popular eating spot managed by the famous boxer. Excels in charcoal broiled steaks and seafood at its best.

John Wanamaker's Crystal Tea Room, 13th & Chestnut St. Rittenhouse 6-1000. Largest dining room in Philadelphia on 9th floor of Wanamaker Store. Composed of main dining room, men's grill and La Fountaine. Known for excellent cuisine and beautiful appointments. Impressive atmosphere. Open from luncheon 11 am to 2:30 pm. Dinner Wed. night 5 pm to 8 pm.

Warwick Hotel, 17 & Locust St. Pennypacker 5-3800. **Embassy Room,** exclusive atmosphere with organ music during dinner. Open 7 am to 9 pm.

Warwick Room, smart dining spot with dancing 6 to 9 pm. Open to 1 am. **Coach Room,** business men's lunch in delightful masculine atmosphere. Exclusive men's bar. Fri. and Sat. after 4 pm, escorted ladies welcome. This is the hotel where Shrimps la Maze originated. You owe it to yourself to taste this exquisite delicacy.

Whitman's, 1626 Chestnut St. Rittenhouse 6-5070. Three public rooms. Soda fountain on first floor. Open 8:30 am to midnight. Breakfast, luncheon, tea and fountain service. Here you get the best chocolate soda in Phila. Second-floor dining room—excellent food in refined atmosphere. Open 11:30 am to 8:30 pm. **Men's Grille Mezzanine**—Luncheon only 11:20 am to 2:30 pm. Attractive to business men because of rapid service and variety of lunches. Air-conditioned.

Private Clubs. Philadelphia thrives on its private eating clubs, and if you are invited to eat at one of these, you'll not be disappointed. Perhaps largest and most impressive is **Union League Club of Philadelphia,** Broad and Sansom Sts—rampart of Republican cohorts, in Wm. Penn's town. Next in size and stature is **Racquet Club,** exclusively male—delightful atmosphere—16th St. below Walnut St. The most exclusive club is perhaps the **Philadelphia Club,** 13th & Walnut Sts. The **University Club** at 16th and Locust St. is a popular spot with alumni of University of Pennsylvania and other colleges. **Poor Richard** at 1311 Locust St. and **Pen & Pencil Club,** 15th St. below Walnut, are popular with advertising and press representatives. **Rittenhouse Club, Penn Athletic Club, Midday Club, Downtown Club** and **Vespers Club** are favorites with business executives.

Germantown

Delmar Morris, Chelton Ave. and Morris St. Tennessee 9-1862. Food and service exclusive clientele appreciates. A comprehensive menu with a host of delicious variations. Everything homemade—bread, rolls, pastry. The roast beef, turkey dinners and steaks with French-fried onions are specialties that cannot be duplicated. 11:30 am to 8:30 pm.

Dutch Treat Restaurant, 5942 Germantown Ave. Tennessee 9-9564. A new restaurant in Farmers' Market. Along with popular dishes, Pennsylvania Dutch cooking is featured.

North Philadelphia

Brewery Tavern, 1158 N. Hancock St. Market 7-9009. Excellent food served in the shadow of one of Philadelphia's oldest and largest breweries. Service restaurant, tavern and bar. Open 11 am to 1 am.

Fisher's Restaurant, 3545 N. Broad St. English style. Choice steaks, chops and seafood. A good place to eat at reasonable prices. Air-conditioned. Open 11 am to 9 pm.

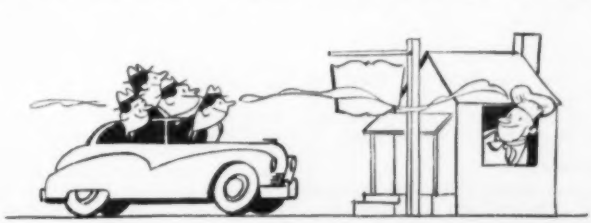
Martin's, 5822-28 Old Fork Road. Walnut 4-4981. Continental meals and the finest in American seafoods. Real French, Hungarian and Italian dishes. Operate own pastry shop; feature 40 desserts, including French pastries and cream pies. Open 11:30 am to 1 am.

Mosebach's, 3736 Germantown Ave. One of old Philadelphia's standbys for good food in German manner. Seafood, chops and steaks. Open 12 noon to 9 pm.

Swartzwald Inn, 2nd and Olney Ave. Hancock 4-9653. Located in North Philadelphia—30 min. drive from City Hall. This eating spot provides the atmosphere of old German culture. Excellent cuisine with air-conditioned private dining rooms.

South Philadelphia

Salvatore Marra's, 1734 E. Passyunk Ave. Fulton 9-9042. If you enjoy a pizza late in the evening, here is the



spot where you will get one that will be long remembered.

Palumbo's, 824 Catherine St. Market 7-7272. An off-the-beaten-track favorite with many Philadelphians, featuring the famous Palumbo full-course dinner with cocktail. Extravagant revues thrice nightly. Dinner show 8 pm; 2-hr midnight frolic.

Victor Cafe, 1303 Dickenson St. Howard 8-3050. This is a music-lover's rendezvous, known from Coast to Coast. Playing old-time favorites, recorded as far back as 1900. Excellent Italian and American food.

West Philadelphia

Penn Sheraton Hotel, 39th and Chestnut Sts. Evergreen 6-9000. Restaurant, coffee shop, snack bar and cocktail lounge. One of Philadelphia's newest dining rooms and cocktail rooms. Versatile chef can deliver excellent Chinese, Italian, or Pennsylvania Dutch dishes, as well as good American food. **Chess Bar** features a 300-sq in. television screen. Bill Dalton gives on the Hammond organ in the cocktail lounge. Nearest to Tool Show. Restaurants open 7 am to 9 pm.

Philadelphia Suburbs

If you have a car, these selections will interest you. Some are also reachable by taxi at reasonable cost. Restaurants at Atlantic City are included for weekend vacationers, although Atlantic City is 65 miles from Philadelphia proper.

Ambler, Pa.

Blue Bell Inn, Skippack and Penllyn Pikes. Ambler 9954. A real early-day setting for food that is custom-prepared and cooked to delight a gourmet. Be it seafood, steaks, or chops, you'll not be disappointed in this hostelry—if you can find a friend to drive you out.

Old Mill Manor House, Bethlehem Pike and Tennis Ave. Ambler 1611. Beautifully situated on Bethlehem Pike. Serving home-style meals, varieties of salads and vegetables. Homey atmosphere. Music. Open 12 noon to 8 pm.

Ardmore, Pa.

Viking Inn, 128th St. and Lancaster Ave. Ardmore 9539. A delightful place to eat in suburban Philadelphia. Unique for a real extensive Smörgasbord, as well as steaks, chops and selected seafoods.

Bala-Cynwyd, Pa.

Bala Inn, City Line and Bala Ave. Cynwyd 9193. Good food served in refined atmosphere. Dining room and bar. Service 11:45 am. to 9 pm.

Boyertown, Pa.

Mansion House. Located in the beautiful Pennsylvania countryside—a

well-worth while 45-mile drive on a beautiful day—rewarded with excellent cooking in pleasant environment.

Chester, Pa.

The Club House Hotel, 511 Welsh St. Chester 3-8286. Large Colonial-style dining room. Cocktail room with dancing. 9 pm to 1 am. Entertainment Wed., Fri. and Sat. Food served 11:30 am to 9 pm.

Doylestown, Pa.

Fountain House, Main & State Sts. Doylestown 9393. Noted for its display of antiques and its Old English style grillroom. A wide variety of foods, delicious deviled crab. Open 12 noon to 2 pm, 5 to 8 pm.

Essington, Pa.

Walber's on the Delaware. Taylor Ave. and Delaware River. Tinicum 9331. If you enjoy a lobster dinner served in water-front atmosphere, you'll be sure to enjoy Walber's. The lobster dinners are tops!

Downington, Pa.

The Dutch Cupboard, Route 340, ½ mile north of Route 30. Smörgasbord has Swedish items. The meals are good plain American style. Situated in an old farm house on 30 acres of land in the heart of Chester Valley. Open 12 noon to 7:30 pm. No liquor permitted in the restaurant.

Merion, Pa.

General Wayne Inn, 625 Montgomery Ave. Narberth 9275. High-grade restaurant and bar, catering to Philadelphia's Main Line. Excellent food. Dinners from 6 pm.

New Hope, Pa.

Tow Path Inn. Located in world-famous Bucks County, home of Playhouse. Patronized by many famous in art, theater, and movie world. This restaurant, located on the banks of a picturesque old canal, is well worth a visit, and good food will be your reward, as well as delightful surroundings.

Phoenixville, Pa.

The Bull Tavern. For beautiful scenery, see Valley Forge National Park, then continue on a few miles on Route 23 to this country place. Order the special charcoal-broiled steak.

Swarthmore, Pa.

Ingleneuk Tea Room, 120 Park Ave. Swarthmore 4569. A comfortable drive out to Swarthmore will be enhanced by taking lunch or dinner at this charming little place where food is always inviting. Luncheon 12 to 1:30, dinner 5:30 to 8 pm. This tea room is so popular that reservations are almost always a necessity.

West Chester, Pa.

The Mansion House, Church & Market Sts. Serving suburban Philadelphia since 1830. Good food, steaks, chops, lobsters, and wide variety of other dishes. Breakfast 7 to 10 am, lunch 11:30 am to 2 pm, dinner 5 to 8.

New Jersey

Atlantic City, N. J.

Claridge Hotel, Boardwalk. This hotel serves some of the most delicious seafoods, steaks, chops and American dishes available in this resort.

Hackney's, Boardwalk. Famous from Coast to Coast for seafood, steaks, chops and platters. On the inlet.

Knife & Fork Tavern. Milt Latch's famous eating place, specializing in seafood, steaks and chops. Open 12 noon to 9 pm.

Camden, N. J.

Club Shaguire, Central Airport Circle. Merchantville 8-2043. Specializing in charcoal-broiled filet mignon and lobsters. Two floor shows nightly, 8:30 and 11:30 pm. Dancing. Open 6 pm to 2 am.

Hofbrau Restaurant, Central Airport Circle. Woodlawn 4270. Famous for fun and food; real Bavarian atmosphere. Specializing in German dishes, sauerbraten, knockwurst, bratwurst, delicious steaks (charcoal-broiled). New York floor shows 8 and 12 pm. Dancing. Open 11 am to 2 am.

Clementon, N. J.

Silver Lake Inn, White Horse Pike, Route 30. Laurel Springs 4-8400. Service restaurant, Smörgasbord and cocktail lounge. American and Swedish food. Specialize in steamed clams, lobster and steak. Dinner served noon to 1 am, music 7 pm to midnight.

Haddonfield, N. J.

Malatesta's Parkway Villa, Route 40 and Grove St. Merchantville 8-9609. American and Italian food. Famous for home-style spaghetti and chicken cacciatoré. Also seafood and chops. Dinner served to 9 pm.

Merchantville, N. J.

Marlton Manor, Route 40, near Garden State Race Track. Merchantville 8-0828. Here's the place where any appetite can be satisfied, be it steaks, lobster, pheasant, squab, or frog's legs. Delicious snapper and French onion soups. Music nightly, dancing nightly except Monday. 11 am to 3 am.

THE TOOL SHOW •

Who's Where Among the Exhibitors at the ASTE Industrial Cost-Cutting Exposition at the Philadelphia Convention Hall April 10 to 14. The Floor Plan Is Included

EXHIBITORS

A

	Booth
Accurate Bushing Co.	142
Ace Abrasive Laboratories	1148
Acme Steel Co.	234
Acme Tool Co.	766
Acme Winter Corp.	765
Adel Precision Products Corp.	1040
Airborne Accessories	1122
Air-Speed Tool Co.	728
Ajax Electric Co., Inc.	434
Allegheny Ludlum Steel Corp.	618
The Allen Mfg. Co.	524
Allied Products Corp.	665
Allison Corp.	206
Alpha Corp.	718
American Machine & Foundry Co., Wahlstrom Tool Div.	659
American Machinist	416
American Pullmax Co., Inc.	958
American Society of Tool Engineers	888
B. C. Ames Co.	710
Ampco Metal, Inc.	1131
Amplex Mfg. Co., Div. Chrysler Corp.	1107
Anderson & Sons, Inc.	329
F. E. Anderson Oil Co.	422
R. B. Annis Co.	1056
Anton Machine Works	17
The Apex Tool & Cutter Co., Inc.	5
Armstrong-Blum Mfg. Co.	521
Armstrong Bros. Tool Co.	1047
The Aro Equipment Corp.	741
E. C. Atkins & Co.	654
Atlas Press Co.	1008
Austenal Laboratories, Inc.	520
Automotive Industries	408

B

W. O. Barnes Co., Inc.	339
Bausch & Lomb Optical Co.	407
Bay State Abrasive Products Co.	966
Beaver Tool & Engineering Corp.	433
The Bellows Co.	802
Bemis & Call Co.	1054
Bendix-Westinghouse Automotive Air Brake Co.	333
Benzon Machine Co.	658
Black Drill Co.	724
Edward Blake Co.	919
Henry P. Boggis & Co.	401
Boice-Crane Co.	1139
Bokum Tool Co., Inc.	1049
Boyar-Schultz Corp.	133
Bridgeport Machines, Inc.	1031
The Brinnell Co.	567
Brown & Sharpe Mfg. Co.	849
Charles Bruning Co., Inc.	801
Brush Development Co.	33
Bryant Chucking Grinder Co.	3

C

Cadillac Gage Co.	924
Cadillac Stamp Co.	753
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Circular Tool Co., Inc.	225
Cities Service Oil Co.	636
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Hitchcock Publishing Co.	548
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Oakite Products Inc.	565
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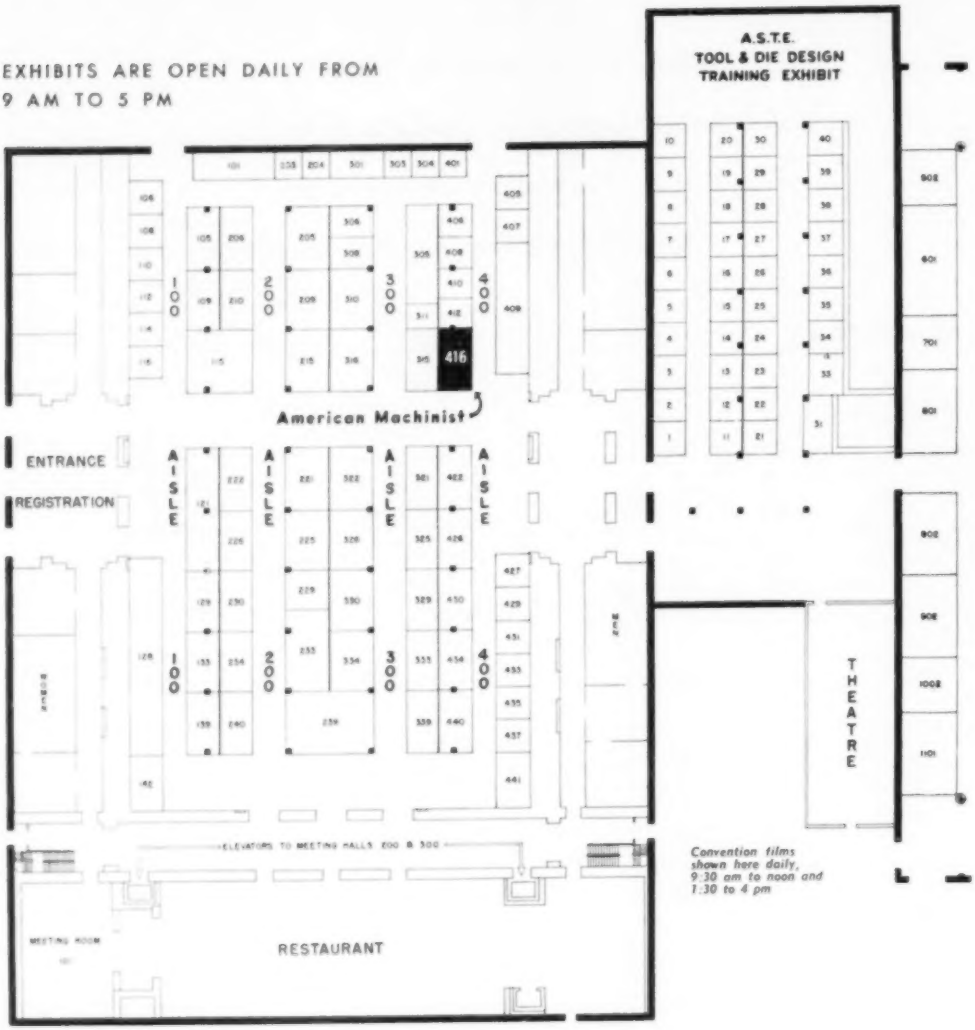
Philadelphia's Convention Hall Will Be the Scene of the

EXHIBITS ARE OPEN DAILY FROM
9 AM TO 5 PM



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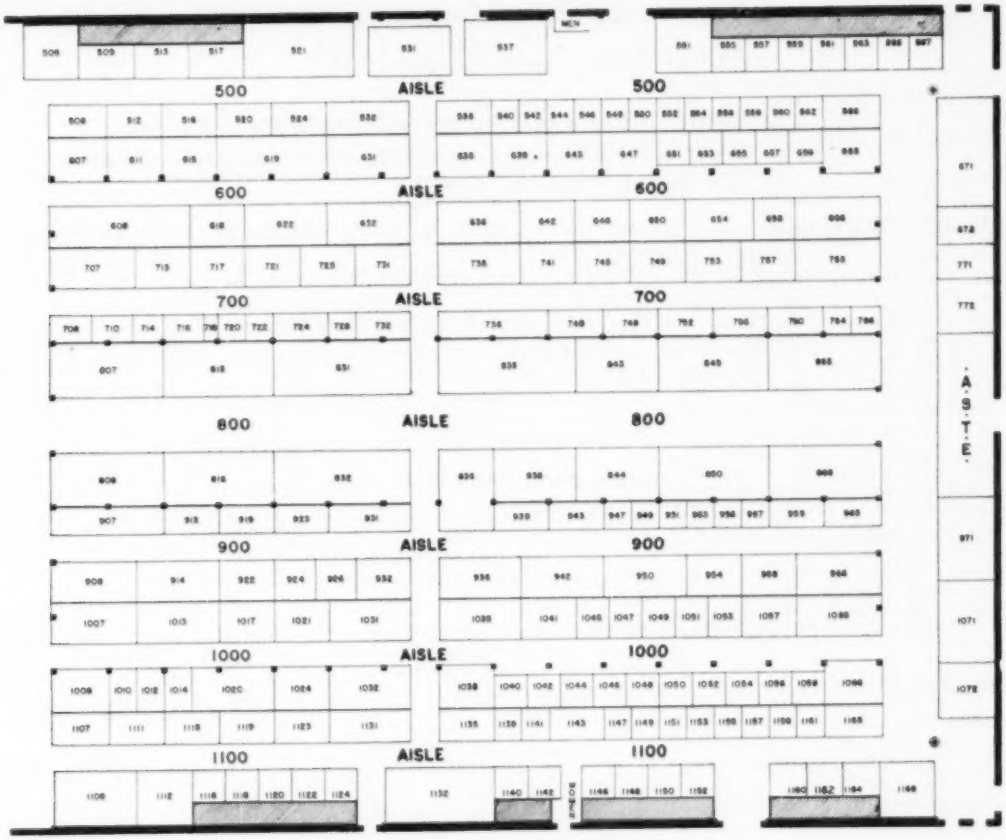
Standard Electrical Tool Co. 965
Standard Gage Co., Inc. 932



Standard Pressed Steel Co. 128
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Edwin B. Stimpson Co., Inc. 647
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S. B. Whistler & Sons Inc. 832
The Wickman Manufacturing Co. 109
Wilson Mechanical Instrument Co., Inc. Associate of American Chain & Cable Co., Inc. 226
Wilton Tool Mfg. Co. 550
N. A. Woodworth Co. 435

Z

Zagar Tool, Inc. 1124

TOOL SHOW PROGRAM •

18th Annual Meeting and Exposition of the American Society of Tool Engineers Philadelphia, April 10-14, 1950

EXHIBITS are open daily 9:00 am to 5:00 pm at Convention Hall

TECHNICAL FILMS are shown daily in Convention Hall Theatre from 9:30 am to noon and 1:30 to 4:00 pm

MONDAY, APRIL 10

1:00 PM—Plant Tours to The Budd Co.; Philco Corp.; Westinghouse Electric Corp.; and Yale & Towne Mfg. Co.

2:00 PM — DEVELOPMENTS IN PRESSWORKING OF METALS (Convention Hall, Ballroom). (a) "Forming Sheet Metal by the Marform Process" — **Speaker,** R. B. Schulze, gen. supervisor of mfg. research, The Glenn L. Martin Co. (b) "Carbide Die Developments" — **Speaker,** G. F. Eglinton, vice pres., Lincoln Park Industries.—COLD EXTRUSION OF METALS (Convention Hall, Room 200). **Speaker,** J. P. Bowden, Heintz Mfg. Co.

8:00 PM — ECONOMIC FORUM (Philadelphia Academy of Music).

TUESDAY, APRIL 11

9:00 AM—DESIGN AND USE OF DIECASTING DIES (Convention Hall, Room 200). **Speaker,** Chas. Franklin, master mechanic, Rochester Products Div., General Motors Corp.

9:00 AM—Plant Tours to Baldwin Locomotive; Crown Can Co.; Link-Belt Co.; RCA Corp. (Camden), and SKF Industries, Inc.

1:00 PM—Plant Tours to The Budd Co.; Philco Corp.; Westinghouse Electric Corp.; and Yale & Towne Mfg. Co.

2:00 PM — AUTOMATION OF GROUND AND TURNED PRODUCTION PARTS (Convention Hall, Room 200). **Speaker,** N. L. Bean, chief design engr., Automatic Transmission Program, Ford Motor Co.—MACHINING AND FABRICATION OF HIGH-TEMPERATURE ALLOYS (Convention Hall, Ballroom). **Speaker,** C. L. Sadon, mfg. engr., Aircraft Gas Turbine Div., General Electric Co.

8:00 PM—MACHINABILITY (Benjamin Franklin Hotel Ballroom). **Speaker,** R. T. Hurley, pres., Curtiss-Wright Corp.—TRENDS IN DRILLING (Bellevue-Stratford Hotel, Rose Room). (a) "Application of Drill Units to Standard and Special Machinery"—**Speaker,** Eugene Numrich, application engr., Avey Drilling Machine Co. (b) "Micro Drilling"—**Speaker,** J. A. Cupler II, general mgr., National Jet Co.

WEDNESDAY, APRIL 12

9:00 AM — METAMICS (Convention Hall, Room 200). **Speaker,** W. O. Sweeny, Jr., asst. sales mgr., Haynes-Stellite Div., Union Carbide & Carbon Corp.

9 AM—Plant Tours to Baldwin Locomotive Works; Crown Can Co.; Link-Belt Co.; RCA Corp. (Camden), and SKF Industries, Inc.

1:00 PM — Plant Tours to The Budd Co.; Philco Corp.. Westinghouse Electric Corp.; and Yale & Towne Mfg. Co.

2:00 PM—COLD ROLL FORMING OF METALS (Convention Hall, Room 200)—**Speaker,** E. J. Vanderploeg, development engr., The Yoder Co. — AUTOMATION (Convention Hall, Ballroom). (a) "Automation in Forging and Heat Treating"—**Speaker,** from Oldsmobile Div., General Motors. (b) "Automation in the Press Room" — **Speaker,** Herman Zorn, pres., V & O Press. Co.

8:00 PM — TOOLING UP FOR MODERN TRUCK ENGINE PRODUCTION (Benjamin Franklin Hotel, Ballroom). **Speaker,** Joseph Olender, mechanical engr., International Harvester Co.—USE OF ELEMENT TIME DATA FOR EFFECTIVE TOOL DESIGN (Hotel Bellevue-Stratford, Rose Room). **Speakers**—N. M. Perris and H. K. Keever, partners, Stevenson, Jordan & Harrison, Inc.

THURSDAY, APRIL 13

9:00 AM—HARD SURFACING OF PRODUCTION TOOLS AND GAGES (Convention Hall, Ballroom). (a) "Nitriding of High Speed Steel Tools and Gages"—**Speaker,** J. G. Morrison, chief metallurgist, Landis Machine Co. (b) "Hard Chrome Plating" —**Speaker,** B. A. Taylor, vice pres., Chrome Electro-Forming Co.

9:00 AM—Plant Tours to Baldwin Locomotive Works; Crown Can Co.; Link-Belt Co.; RCA Corp., Camden and SKF Industries, Inc.

1:00 PM—Plant Tours to The Budd Co.; Philco Corp.; Westinghouse Electric Corp.; and Yale & Towne Mfg. Co.

2:00 PM — BROACHING APPLICATIONS FOR COST REDUCTION (Convention Hall, Ballroom). **Speaker,** O. W. Bonnafe, chief research engr., The LaPointe Machine Tool Co. — AUTOMATION IN HOPPER FEEDS FOR ASSEMBLIES (Convention Hall, Room 200). **Speaker,** C. E. Kraus, pres., Kraus Design, Inc.

7:00 PM — ANNUAL BANQUET (Bellevue-Stratford Hotel, Ballroom).

FRIDAY, APRIL 14

9:00 AM—DESIGN ECONOMICS (Convention Hall, Ballroom), **Speaker,** John VanHamersveld, supervisor, Design Cost Control Group, Glenn L. Martin Co.

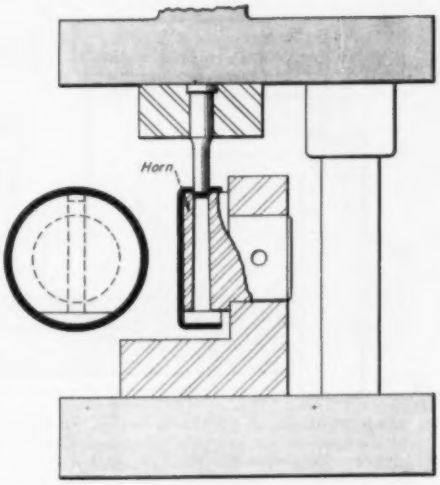
9:00 AM—Plant Tours to Baldwin Locomotive Works; Crown Can Co.; Link-Belt Co.; RCA Corp. (Camden), and SKF Industries, Inc.

2:00 PM — INVESTMENT CASTING (Convention Hall, Ballroom). **Speaker,** T. F. Frangos, sales engr., Haynes-Stellite Div., Union Carbide & Carbon Corp.—EFFECT OF LATEST AMERICAN STANDARDS ON SPINDLE DEFLECTIONS (Convention Hall, Room 200). **Speaker,** Dr. Max Kronenberg, consulting engr.

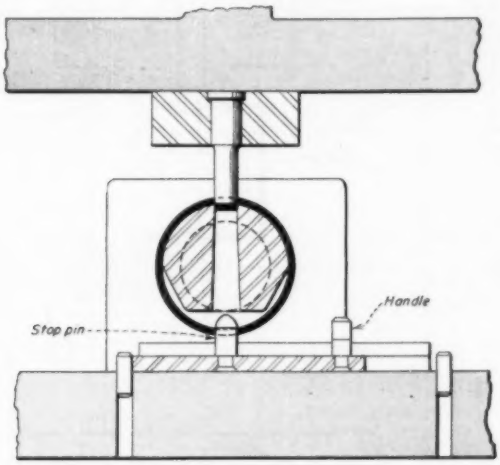
HORN DIES WILL DO MANY JOBS

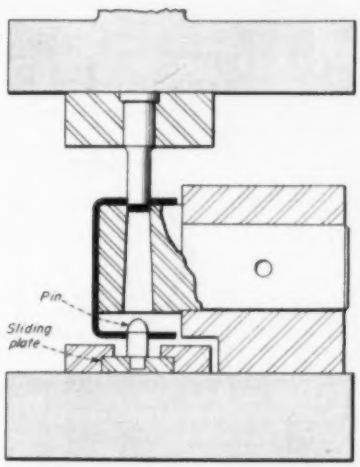
Secondary operations like piercing, notching, seaming of shells and tubes are done, also stamping and lettering of shells and machined parts. Design rules are: (1) make the horn as sturdy as possible, (2) provide strong horn support to resist bending, (3) guide slender punches in a stripper, (4) always support work under the punch when stamping

BY J. R. PAQUIN, Tool Engineer,
UNDERWOOD CORPORATION

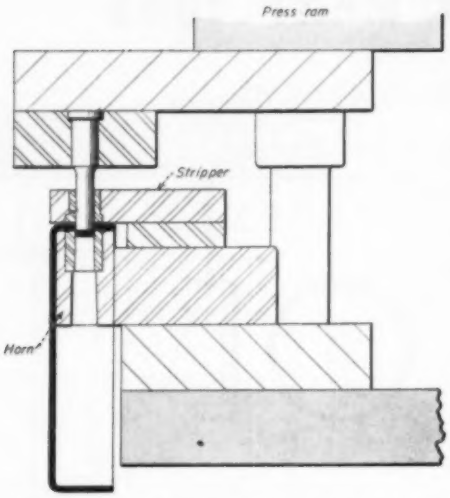


To pierce a hole in a shallow-drawn shell, the part is pushed onto a horn inserted in an angle block. A headed punch is contained in the punch plate. A flat on the bottom of the horn provides slug relief

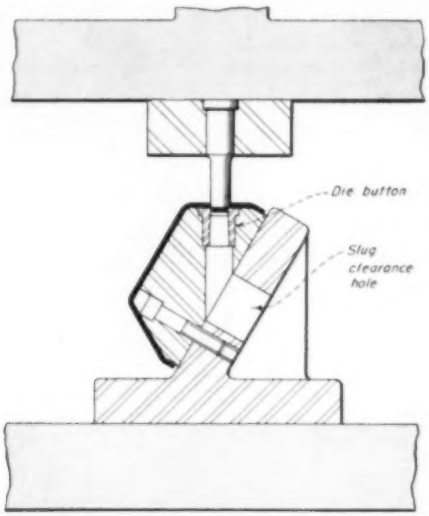




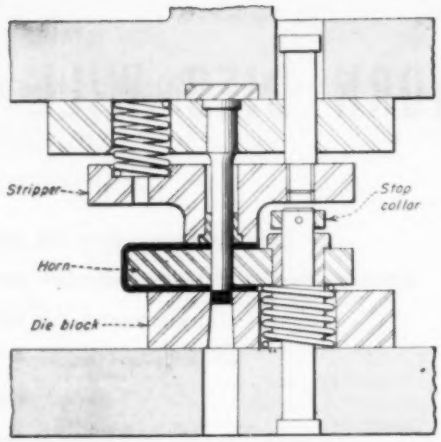
Two opposed holes are accurately located by use of a sliding locating pin. With the sliding plate (on which the pin is mounted) pushed to right, the shell is placed over horn. After the first hole is pierced, the shell is rotated and the slide is moved left to a stop pin. With the locating pin engaged in the first pierced hole, the press is again tripped to pierce the second hole. This is inexpensive construction for dies of this type



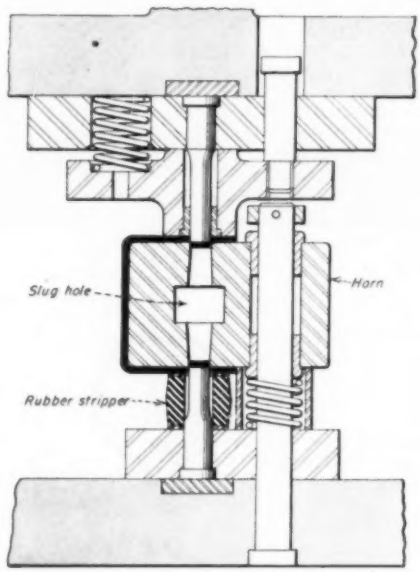
Large shells can be pierced by moving the die-holder to the front of the bolster plate and applying a horn that overhangs the bolster. A die button is mounted in the horn, and the stripper has a guide bushing to support the punch. This tool design permits handling shells larger in diameter than the maximum opening between press ram and bolster plate



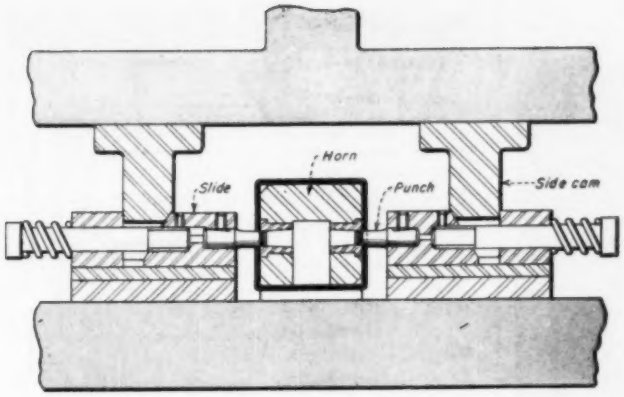
Irregular shells are pierced by mounting the horn on an angle plate. Cast iron can be used for the bracket if light piercing is involved; cast steel is used for shells of thick cross-section, but a weldment may not resist repeated shock



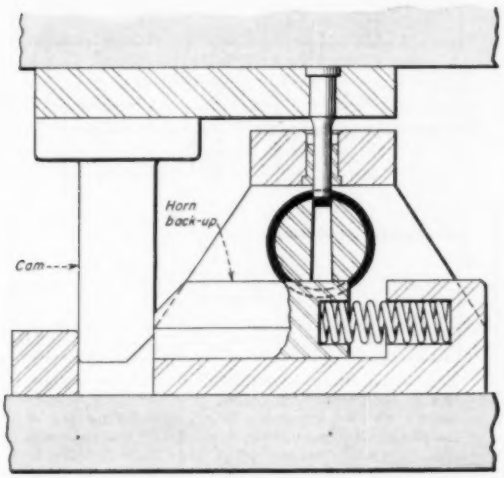
Opposite holes can be pierced in one stroke, using the slug from the first hole as the punch for the second hole. Fracture will be fairly clean, but there will be a burr on lower outside of part. Channel-shaped piece is placed over horn, which is spring supported. A spring stripper contacts work first, causes horn to bottom on die block. Further ram descent causes punch to pierce upper hole, then push slug through horn opening until bottom of piece is punched out. As ram ascends, a spring raises the horn to loading position

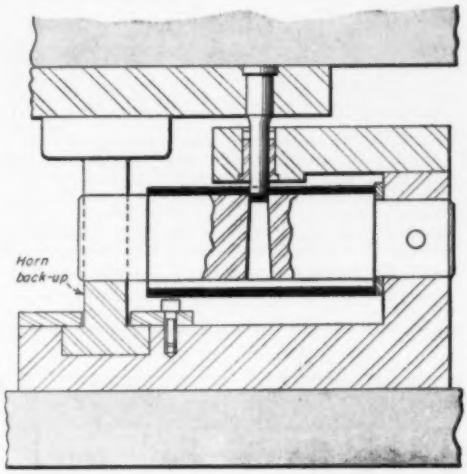


If burr on opposite holes must be inside the part, punches must be used in both punch-holder and die-holder. The horn is spring-supported on a guide pin fitted with stop to limit upward travel. Ram descent forces work and horn downward, so lower punch pierces the part. A rubber spring strips the part from the lower punch

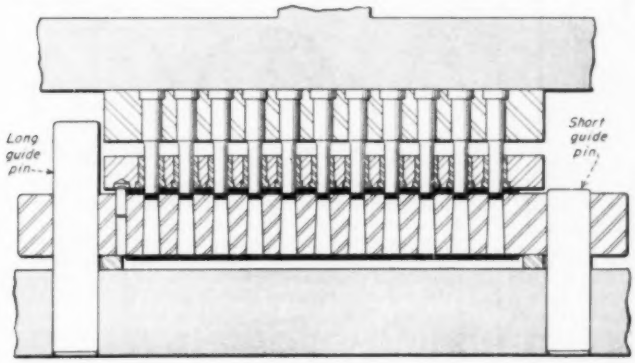


Side cams can also be used to pierce opposed holes in a part, and the arrangement is useful when shut height is limited. The cams force inward the two slides carrying piercing punches. A slot machined in the horn allows slugs to drop out when part is removed. Springs on rods retract the slides when the ram ascends

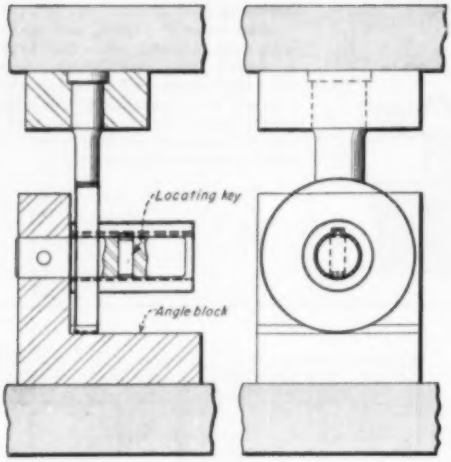




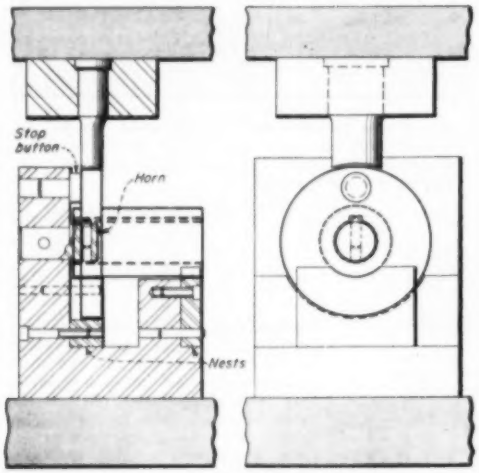
A cam-operated back-up block for the horn is used when overhang is excessive. When the ram descends, the cam forces the back-up block under the horn. When the ram ascends, a spring returns the block to the idle position, so that the work can be removed from the horn. Because of severe pressure required for piercing the heavy pipe, the punch is guided in a solid stripper



Multiple holes can be pierced in long length parts by using a horn that slides on one long guide pin and one short guide pin. To load, the horn is raised until it clears the short pin and can be swung to one side. In the piercing position, the horn is supported by two pads. Good horn location and solid support make the tool suitable for low- and medium-production requirements

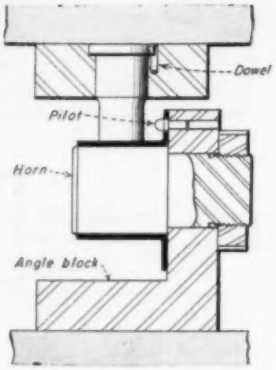


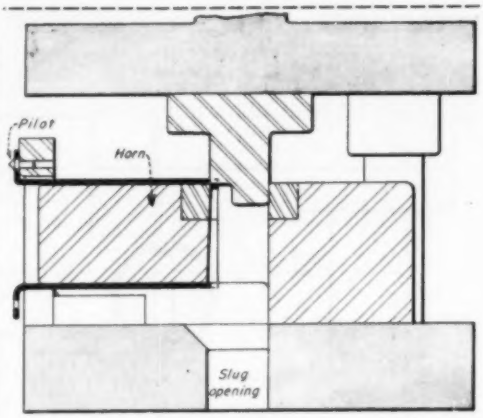
Lettering of machined parts can be done in horn dies. A patent number is shown being stamped on the periphery of a screw-machine part in relation to a keyway. A drillrod locating pin, or key, in the horn fits the keyway in the part. To take the stamping pressure, the angle block is machined to the part radius, then carburized and hardened, to serve as a nest. The horn is merely a loose fit in the product hole



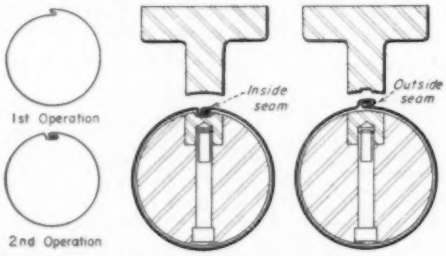
High-production requirements dictate refinements in a horn die for stamping machined parts. The horn is made just long enough to hold the locating key. Work ends are supported by two hardened nests. And a hardened button stops the work in the correct position under the punch

Stamping of a trademark or lettering on a shell can be done on a simple horn die. Radial position of the marking on the bottomless shell is obtained with a pilot that enters a locating hole in the flange. To prevent possible rotation of the headed punch, a dowel is pressed half in the punch and half in the punch plate





Notches are cut in the periphery of a flanged, bottomless shell. The part is placed over the horn and located by a pilot entering a hole previously pierced in the flange. A hardened block is set into the horn and does the cutting in conjunction with the heeled punch. The part is then pulled back and rotated so that the pilot enters the next locating hole



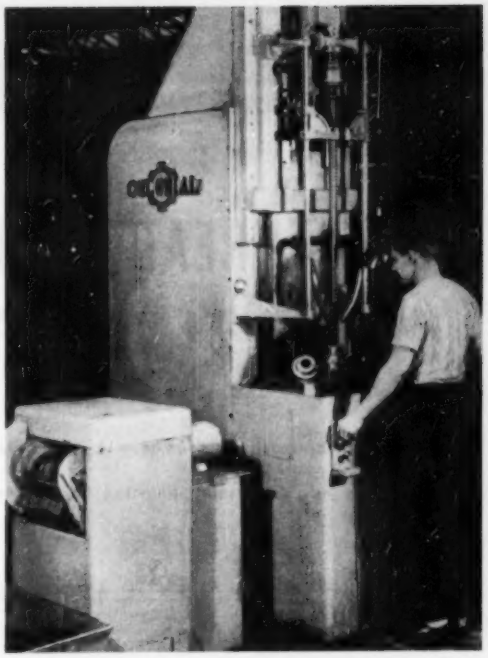
Inside or outside seaming of round tubes can be done with horning dies. The blank is first reverse bent on the ends and the ends are hooked. Next, the part is placed in the horn die and the ends are mashed flat. Difference between tools for inside and outside seams is distinguished thus: to make an inside seam, a depression of the same contour as the finished seam is cut in the die, and the punch is merely radiused, while in the case of an outside seam, the depression is cut in the punch face

BROACHING 59 VARIETIES

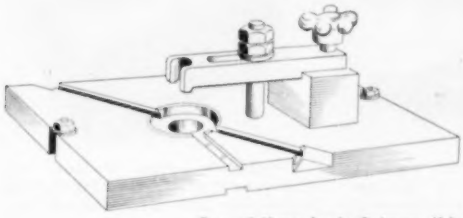
Fifty-nine diverse parts for Warner & Swasey textile machines are produced on one Colonial pull-down broaching machine rated at 10 tons, 54-in. stroke. Pulleys, levers, cams, wheels, clutch yokes, pawl carriers and many other parts require internal broaching of regular and irregular surfaces, splines, keyways, etc. These are all processed on the one machine with three basic fixtures and individual fixture adapters. Thus, broaching's inherent advantages of rapid metal removal and accuracy are obtained on short runs at low cost.

Fixtures are operated manually because the time to hook up automatic cycle control is not worth the time saved over manual clamping. Fixtures are quickly interchanged on the machine. Adapters are designed so that a number of identical parts, especially the thin ones, can be stacked and broached at once. Parts are designed so that as many different ones as possible can be handled with the same broach.

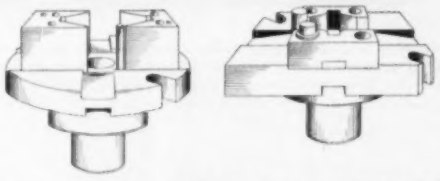
So far as possible, automatic pullers and broach-handling cups are standardized. Thus, a minimum number of these items are required for operation of the machine. All broaches of approximately the same diameter are handled by the same size of puller.



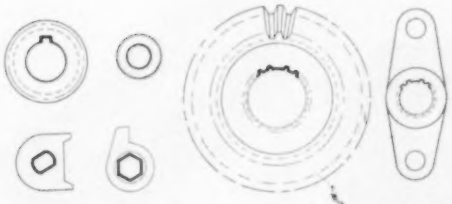
To facilitate fixture interchange and part loading, the machine is set in a pit. A conveyor lifts out chips



One of three basic fixtures, this one processes 28 different parts



Two of the adapters for the fixture shown. Part at left below is broached 10 at once, using broach illustrated

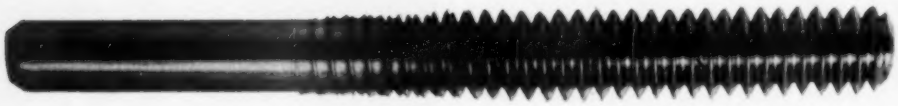


These parts and 22 others are handled by basic fixture

Tooling cost is reduced by designing one broach to handle 11 parts

Examples of 11 types of cams and couplings, all of which are splined with same broach

THIS IS THREAD ROLLING IN ITS BASIC FORM...

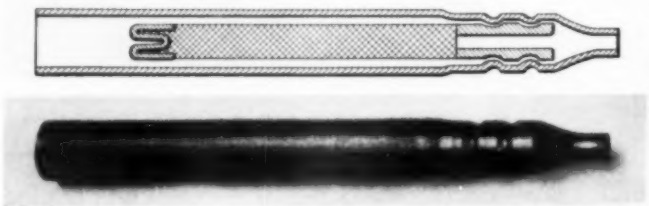


Parts collected by Reed Rolled Thread Die Co.

...BUT THREAD ROLLING IS NOT ALWAYS THREADING

A familiar operation is seen here in some unfamiliar applications.

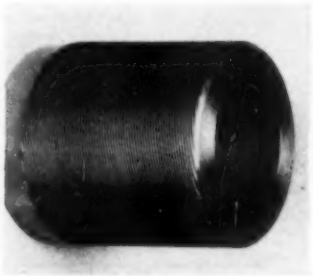
It turns up doing forming, knurling, burnishing, fluting, assembly, and—occasionally—threading.



Assembly and sizing operations are performed on this refrigerator part. The rolled grooves anchor a filter cartridge into the outside shell. At the same time the diameter adjacent to the grooves is sized for a subsequent assembly operation. Production is 21 pieces per min.

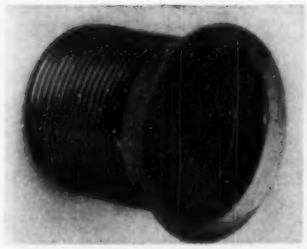
Forming operation produces pipe coupling from short section of plain steel pipe. Ends of couplings are subsequently threaded

Burnishing of worm-gear rolls is performed by circular thread-rolling dies. Part at left has not been burnished, part at right has. There is always some burnishing action in the rolling process; it can be increased by changing the die diameters

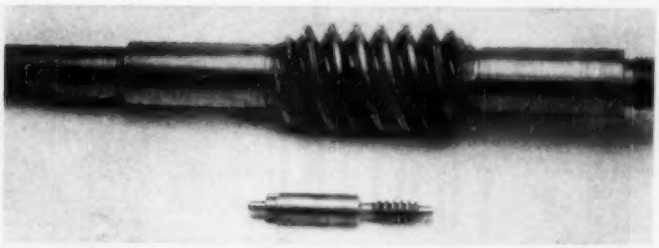


36 starts on this lens part (required to give a fine pitch and large lead) are rolled in one operation. The indexing problem that would be created if only one or a few threads were cut at a time is eliminated. Production is about 13 pieces a minute

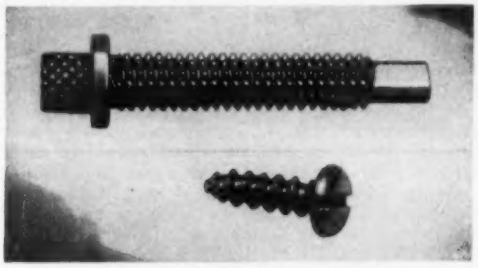
Two-diameter knurls are cut on this brace shell on 1⅛- and 1¾-in. dia. One set of knurls is power driven and the other set is driven by the work to meet differing speed requirements. With an automatic elevating work stop, production is 800 pieces an hour



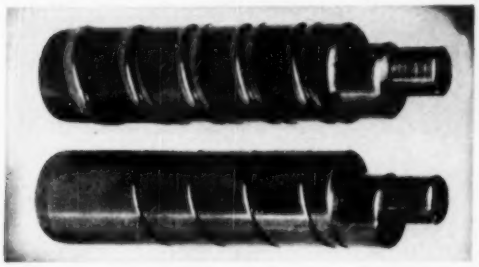
Forming thin stainless steel rather than displacing metal is the method in rolling drain fitting. Threaded mandrel is synchronized with dies so grooves on dies and mandrel will mate. After rolling, the mandrel moves out of machine and continues rotating so operator merely grips part to unscrew it from mandrel. Production is 600 pieces per hour



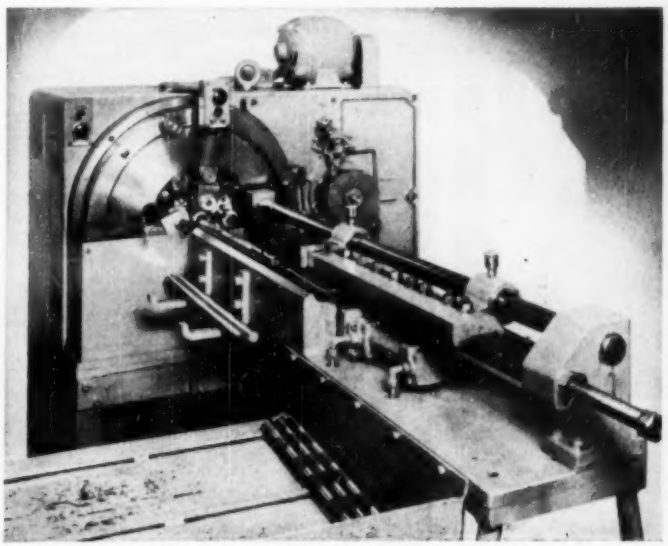
Worms are rolled with burnished surface which gives quieter drive and longer life. Small worm is for a speedometer and is rolled at rate of 800 per hour. Large worm, for a washing machine, is rolled at rate of 300 per hour

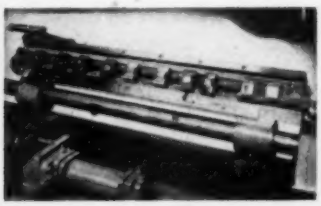


Threads and grooves are rolled simultaneously on the caster adjusting screw (top). One die makes the grooves, the other two the threads. As metal is displaced by one operation it is reformed by the other. Dwell at the end of the cycle permits the dies to straighten out all the metal and produce a clean groove and thread. Sixteen pieces per minute. The sheet-metal screw is formed between reciprocating dies. First third of the die rolls the body, next third the gimlet point, and final third sizes the thread. To roll the wide part at minor diameter, dies start with a sharp V, widen it out by "snowplow" action



Oil grooves are produced by rolling thread with curved root and flat crest (top). Flat crest reduces wear on wheels when part is centerless ground (bottom) after rolling. Finish produced by rolling gives better oil flow than cut grooves. Production is 700 pieces per hour

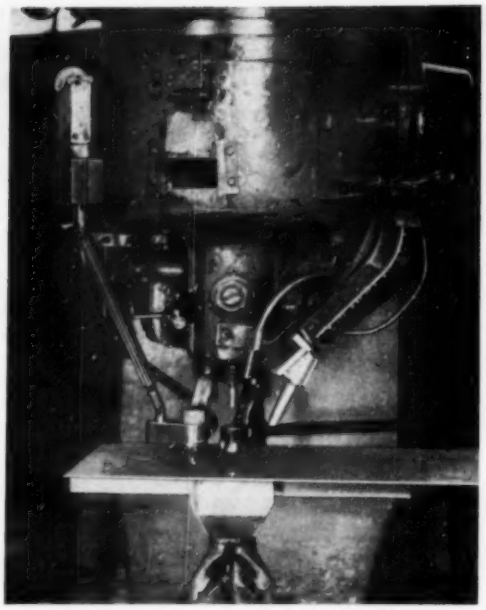




Multi-position rolling is possible with suitable feeding device (left). Stop dogs on the fixtures (shown open above) are set to roll at any pre-determined intervals on a shaft. Dogs automatically start and stop machine as work is fed through it. This setup rolls six sections each on 140 shafts per hour. Cycle is automatic and shaft returns to original position for unloading and loading of the next shaft

TALENTED ☆ TOOLING

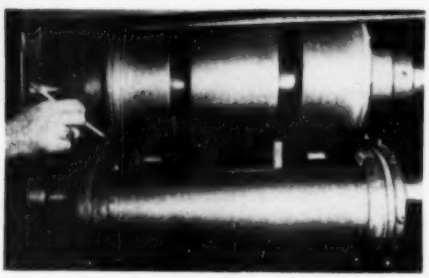
RIVETER DRILL & C'SINK ATTACHMENT PIERCES HEAVY STOCK

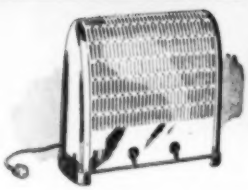


Aircraft skin sections thicker than 0.080 in. cannot be punched with Erco riveters, but they are drilled on converted models of the same machine. Drive motor, universal-joint shaft, and gearbox are added to left side of housing. Alterations included replacing standard punch lift rod with spring-loaded version that stops drilling cycle when drill breaks through. Normal stroke was reduced so machine can drill, countersink, and still punch and rivet. *Consolidated-Vultee*

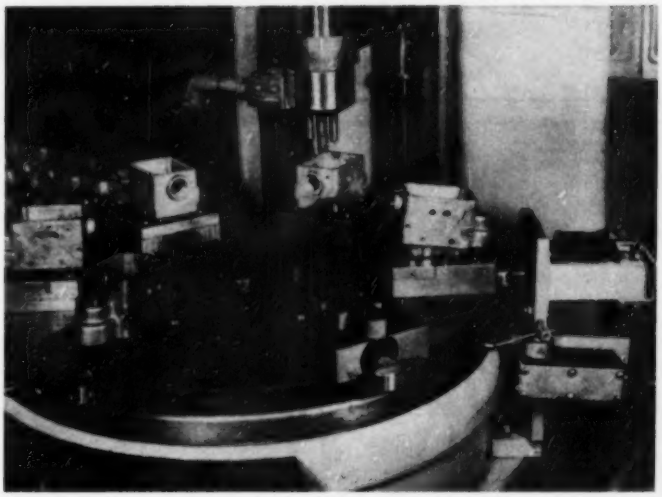
SHOP-BUILT BENDER FORMS COMPOUND-CURVE HEATER SHELLS

Two identical end pieces for an electric-heater casing are drawn to shape, but the center sections are more difficult to produce. These have offset edges to match the end pieces, and must be formed without damaging the perforations. A lower shaft on the special-purpose machine carries two offset oval end plates and a spacer. This drives the pressure rolls on the upper shaft, which exert a fairly constant force. Pushbutton control runs the stock through the matching rollers in under one minute. The lower plates are contoured to form the sheet to a tighter bend than necessary to allow for springback. *Westinghouse Electric*

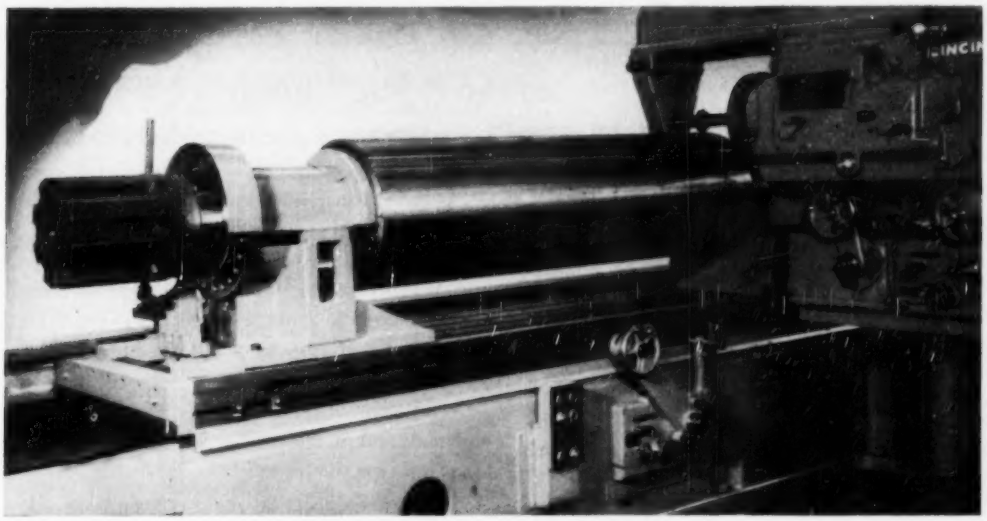


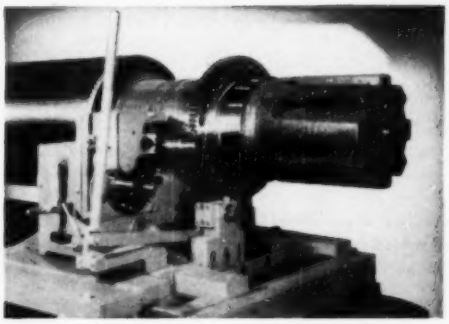


SOLENOID PUSHER RELEASES SWITCH BOXES FROM PRESS FIXTURES



Latch pins are riveted into switch boxes automatically on oil-hydraulic Multipress with six-station rotating table. Operator loads by hand, but sensitive switch energizes solenoid which exerts 14-lb push against release plunger in each fixture. Geneva arbor and driving mechanism index table after each ram action. *Denison Engineering*





HAND INDEXING CONTROLS HEAVY ROLLS FOR GROOVE MILLING

Straight grooves in large floor-plate roll are milled with 4-in. slotting cutter on 36x120-in. horizontal milling machine. Linkage from hand lever to index ring on journal-bearing diameter shifts roll, which is located by a positive stop. Helical grooves can be cut with a gear in place of the stop. A rack on the machine bed rotates the gear to turn the roll as it is fed past the cutter. *Cincinnati Milling*

ROUND TABLE

Back on the Clock

"Some front-office guy loves to shove papers around, all right, putting foremen back on the clock! What's the idea, anyhow? Are they trying to take away about the only privilege we've got?"

Al was storming, but Ed said, quietly, "Shucks, don't get overheated, Al! We both have punched the clock before, and we can do it again. It doesn't take any time."

"It isn't that, Ed, it's the idea of going back to standing in line. I like my boys well enough—it isn't that—but what advantages has a foreman got besides that?"

"Well, Al, I for one am glad of it. I get in on time and put in a lot of extra hours around here. Now they'll show."

"Like heck they will! You won't be paid for 'em because we're on salary anyhow, and if we're on salary, who'll bother to check our attendance? No, Ed, it's just some idea for lining us up like the rest."

"No, Al, everybody will punch now, from the top down. It's a way of taking care of the guys who are always just a little late, or leave a little early."

"Nuts! I can always get somebody to punch my card for me—I did it before."

"Sure, and every time one of your boys does you that little favor, you'll lose some of that position you seem to value so much. If you want the boys to respect you, Al, you'll have to play the clock straight."

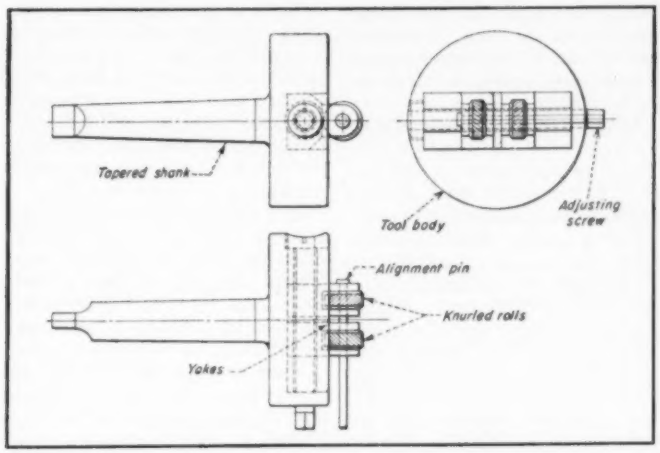
"I will not! They respect my seniority if the management doesn't. I've got plenty of pals who'll do me the favor."

"Yeah, and expect favors in return. Nope, Al, it's just such goings-on that got the clock system put back for all executives. Everybody who was on the management side abused his privileges; there'll be no more of that."

"That's what you think! Just wait and see!"

***SHOULD SUPERVISION** punch the clock too? Is it regimentation or just sound management? If some executives punch, should everybody? Your opinions on this subject will interest others. Discussions of earlier topics appear on later pages.*

Practical Ideas

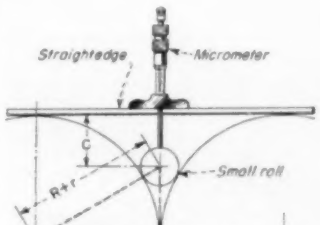


Knurled Swaging Rolls Produce Uniform Headed Assembly Pins

HEADING AND PEENING jobs, where the end of a pin is mashed over to make an assembly permanent, are usually crude in appearance—no matter how effective they are. This swaging tool makes a neat, uniform head on such pins, and is adjustable for pins from ½ in. up to 2 in.

Two hardened knurled rolls are mounted in drilled and tapped yoke holders that ride in a channel in the tool. The top roll is tapped right-hand, and the lower one is tapped left-hand; the adjusting screw has its thread split at the centerline of the tool, and is tapped right-hand on the top half, and left-hand on the lower half. This separates the rolls and closes them up together. Both threads and taps are ⅜-16 NC.

The tool shank is tapered to fit a drillpress spindle or a lathe tailstock. Both roll-holding yokes are cut to the channel shape so no play between them is allowed. A long ¼-in. pin pivots both rolls and is held in a press fit by the upper yoke, but is a slip fit in the lower yoke. This allows the pin to slide when the yokes are separated for larger work. The pin assures alignment of the knurled rolls. *Allan B. Nixon, Springfield, Mass.*



Indirect Method Measured Hidden Press-Feed Rolls

RECENTLY we received a multi-station transfer press from our parent company, complete with spare parts and blueprints. The machine had originally been a brake press, but had been converted to take coiled stock and to blank, cup, draw, perforate, and trim.

In tooling up the machine for one of our jobs, we had to know the diameters of the rolls in the feeding device—which was not included in the blueprint information—so we could design ratchets. It would have taken two men at least a day of hard work to tear the rolls down, and only a small part of each roll was exposed so direct measurement without tearing down would be impossible.

Luckily the rolls were exposed at a point where we could insert a smaller roll in contact with both of them at once. A roll with a small diameter was held against the other two, and a straightedge was laid across the two larger rolls. A depth micrometer was held on the straightedge and the distance to the smaller roll was measured. After allowing for the thickness of the edge, we had the distance from a line between the circumferences of the large rolls to the top of the smaller roll.

Then we did some paper work. A triangle was formed by the lines from the intersection of the two large rolls to the center of the small one, a radius of the large roll, and the sum of the radii of a large and the small rolls. Thus:

$(R+r)^2 = R^2 + (R-C)^2$

where C = the depth micrometer measurement + the radius of the small roll.

$R^2+2rR+r^2 = R^2+R^2-2CR+C^2$, and

$R^2+(-d-2C)\,R+C^2-r^2=0$

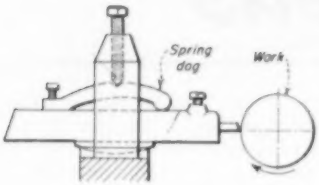
because $d = 2r$.

$$R=\frac{(d+2C)+\sqrt{(-d-2C)^2-4(C^2-r^2)}}{2}, \text{ or}$$

$D=(d+2c)+\sqrt{d^2+4dC+4C-4C+4r}$

$D=(d+2C)+\sqrt{d^2+4dC+4r^2}$

We tried a roller with a diameter of 0.50 in., and got a depth-micrometer reading of 1.12 in. Substituting in the equation, we came out with a large-roll diameter of 5.04 in., so we based our design of the ratchets on that figure. *Ray Cafiero, Brooklyn, N.Y.*



Spring Dog Grips Holder In Reversed Turning Rig

WHILE NOT an everyday rule, there are a few cases that can best be handled by running a lathe backwards to turn down a workpiece. In turning armatures, for example, the copper bars have a tendency to produce burrs that fill the insulating slots.The burrs can be removed by reversing the rotation of the lathe and mounting the tool upside down.

A straight toolholder, like those used for carbide bits, is best for this work, and the holder should be clamped in a setup which will absorbed chatter. This can easily be worked by clamping the holder in a standard toolpost by means of a curved dog. Some spring in the dog will smooth cutting action. The dog should be notched so the capscrew will take a firm grip. *George F. Burnley, Oakland, Calif.*

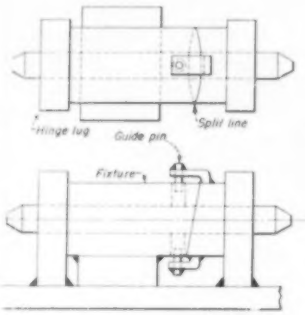
JIG FEET that are subjected to a lot of wear can be made to last longer if they are welded with hard metal, or are hard-faced. The feet can be ground down to size again, and will resist abrasion much longer than will ordinary mild steel. *Edson C. Bates, W. Babylon, N. Y.*

Collapsing Welding Spacer Allows for Heat Distortion

WHEN HINGE LUGS are welded to a plate, the resulting distortion caused by the heat in the part often makes removal of any spacer almost impossible until the part has cooled. This fixture, however, has a spacer that both locates the lugs before welding and collapses after the job so it can be removed.

The spacer body is made from drilled round stock or tubing, and is cut through at an angle of about 10° to the vertical. The two parts are held together by welded guide pins that fit loosely in a hole drilled through the body. An alignment pin through the body locates the two sections of the spacer, which in turn locate the lugs before welding is started.

After the lugs have been welded,



the alignment pin is knocked out and the sections of the spacer are shifted in relation to each other, which reduces the over-all length, and allows removal. *H. G. Frommer, Milwaukee, Wis.*

OUTSIDE SPRAY-PAINTING from a crow's nest instead of a swinging scaffold cut the job time to a quarter of normal. At Curtiss-Wright's Columbus plant double-deck platform was lifted by the plant crane so battleship gray could be sprayed on exterior walls. *Chester S. Ricker, Grosse Pointe, Mich.*

Argon in Furnace Atmosphere Cuts Carbide Failures

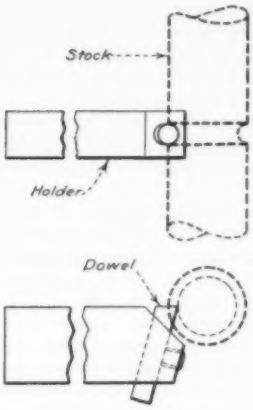
SINCE the introduction of cemented carbides as cutting materials, one of the main regions of failure in tools has been the brazed joint between the carbide tip and the steel shank. This is due to the difference in expansion rates of the two materials when they are heated—not only during brazing, but when the tools are cutting on a job.

Our shop specializes in deep-hole drilling, and many of our drills are made by brazing a preformed gun-drill tip onto a steel shank. Until we adopted our present method of brazing these tips, we were plagued with drill failures.

Some time ago we started using a controlled - atmosphere furnace with hydrogen in the muffle. Hydrogen, we soon found, was causing the tip, the joint, and even the steel shank to become brittle. We then tried helium instead of hydrogen, and this worked fine but was very expensive. Finally we tried argon, and got about the same results as with helium at only about the cost of hydrogen.

The next problem was the flux involved. The flux that worked in the reducing atmosphere of hydrogen did not work well in argon. After experimenting with numerous commercial fluxes, we found that a high-temperature flux was needed. Fluxine No. 20 seems to work well.

Most of our brazing is now done with oxygen-free copper that is produced electrolytically and rolled. The argon gas makes it necessary to run the furnace about 50F hotter than with hydrogen. One result of this new method, aside from stronger brazed joints, is a higher Rockwell reading on the steel drill shanks and tool steels. We are inclined to think that this is an effect—or lack of effect—of the argon on the graphite trays on which the tools are pushed through the furnace. The argon probably has less influence on the graphite's carburizing effect on steel than hydrogen has. *William Eaken, Detroit, Mich.*



Dowel Tool Grooves Stock

HALF-ROUND GROOVES in shafts can be cut with a hardened and ground steel dowel pin. One end of a cold-rolled-steel plate—to fit a toolpost—is drilled and fitted with a tapped cross hole for a setscrew. The dowel is ground off at an angle to provide a cutting edge. On short-run jobs this tool is as good and much cheaper than a form tool. *Roger Isetts, Kenosha, Wis.*

How to Halve Odd Mixed Numbers

MACHINING OPERATIONS often call for dividing dimensions in two. The even ones are easy, even if they are mixed numbers, because you can divide the whole even number by two and multiply the divisor of the fraction by two.

Odd mixed numbers are something else again. Here is a good way to divide them by two in a hurry. First divide the whole odd number by two, and forget the remainder. Then add the divisor and the dividend of the fraction together, and place the result over twice the divisor.

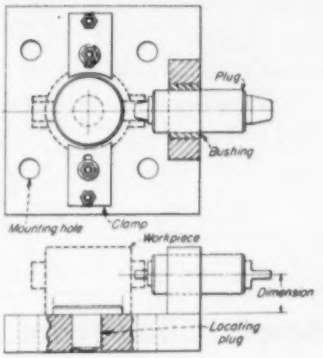
For example, half of 5 9/16 is found by dividing the 5 by 2 and forgetting the remainder—or 1—and adding the parts of the fraction—9 plus 16 is 25—then placing this over twice the divisor—or 32. Result is 2 25/32. *Alvin H. Hammond, Trenton, N. J.*

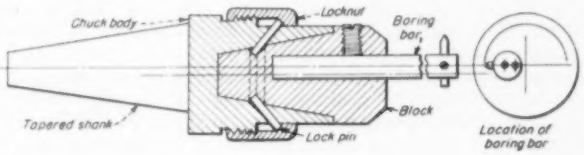
Boring-Machine Fixture Does Double Locating

A FIXTURE that locates both a rough hole, as cast, and a machined hole in the same part—at opposite ends—can be clamped on the table of an automatic boring machine. A square steel base carries two clamps that grip a ledge around the part, and is drilled for a centering plug that locates the part by means of a hole in its bottom.

The top side in the upper view of the base is finish-ground so accurate location of the fixture can be made on the machine table. The support block at the right end houses a bushing and a reversible plug that locates the part by a hole cored through the part. The locating ends on the plug are flat on top and bottom so only horizontal locating is done there. Vertical location is determined by the bottom face of the part.

The cored part is located on the smaller end of the hole plug. It is clamped down firmly, and one end of the cored hole is bored. After this it is released, relocated on the lower plug in a reversed position, the hole plug is reversed to locate the machined hole, and the part is clamped for boring the other end of the hole. *Frank J. Peragine, S. Hempstead, N.Y.*





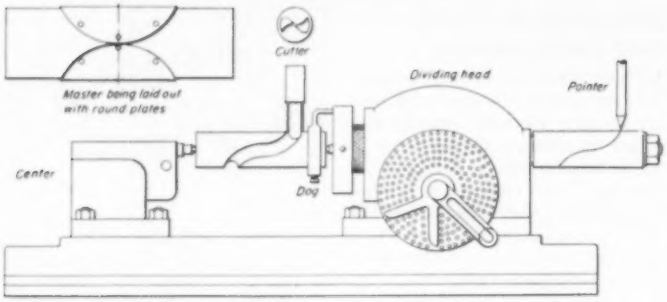
Double-Offset Boring Tool Can Be Adjusted Radially

THIS ADJUSTABLE boring tool is employed on a small bench milling machine, but can be adapted to any size. The tapered shank is cut to fit the machine spindle, and the shank of the bar-holding block is tapered to the same angle.

A section of the bar-holding block is turned down to a groove shape so two pins in slanted holes through the chuck body will rest against a curved surface. These are clamped from the outside by a locknut that grips threads on the chuck body. The action of the pins, when the locknut is turned down, is to clamp the holding block to the chuck body.

To allow for adjustment of the radial position of the toolbit in the boring bar, the centerlines of the tapered shank and the tapered hole in the chuck body do not coincide. They are parallel, but some distance apart so rough radial settings of the toolbit can be made when the boring-bar tool is first set in the spindle of the machine. Fine adjustments are made by loosening the locknut and rotating the boring bar itself. This is possible because the boring-bar hole in the bar-holding block is not centered in the block, but is offset the same amount to the block as the block is to the shank.

The two offsets allow settings that range from dead center (with the shank) to twice the individual offset. *Bert Fraley, Dunham, Ky.*



Scroll Milled From Circle-Scribed Master

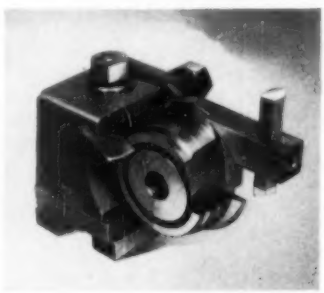
IMPROVISING becomes second nature in a general production shop where many different kinds of metal parts are machined. One odd job was a 2-in. spindle that had to be cut to a scroll shape around its circumference. This was to guide a steel ball that rode in a sleeve that would be located around the spindle.

A ¾-in. round-end cutter was to be run in to a depth of ⅜ in. on a reciprocating layout. Total pitch was 3.1416 in., and the travel was to be harmonic—or would be halves of circles in a development of the spindle's surface.

First a layout was made on a master that fitted on the end of a dividing-plate spindle. Two 3.1416-in. circular disks were cut from 0.008-in. copper stock—which was thin enough to introduce little error when the disks were bent—and were wrapped around the master cylinder. These were located so their edges touched each other, and the spiral layout was scribed from their edges. For accurate location, centerlines were scribed across both disks, and these lines were made to coincide where the two disks touched each other.

After the layout had been made and checked, the master cylinder was mounted on the dividing head, stock was centered between the head and a center on a vertical milling machine, and a dog was fixed to drive the stock from the head. A pointer was located above the master to indicate the scribed line, and the round-end cutter was chucked in the spindle of the machine. For close observation of the scribed line and the pointer, a magnifying glass was mounted on the pointer.

The operator was able to engage a slow table feed when the miller was cutting the portion of the scroll that was sharply slanted but near the ends of the stock, where the scroll changed direction, it was necessary to use hand feed on the table traverse as well as on the dividing head. The dividing head was operated by hand throughout the cutting cycle. *C. D. Mackinnon, Lanarkshire, Scotland.*



Skiving Tool Forms Angle As Turned Piece Is Parted

TWO FORM TOOLS for a screw-machine job had to be wide, so a vertical cutoff tool was impractical. To allow incorporating a cutoff blade in one of the form tools, one operation had to be done separately, somehow. This operation was forming a 15° angle on the back end of the piece, and it was done with a skiving tool.

The skiving tool was mounted in a holder that was clamped on the rear slide by the form-tool bolt so it cut the angle on the back of one part just before the form tool cut it off and formed part of the profile on the new part.

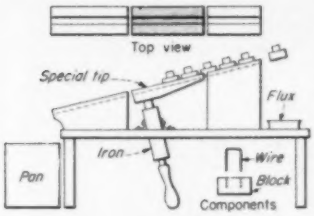
The operations went like this: after the first forming job from the rear slide, the part was drilled, tapped, and counterbored in the end; the front slide was advanced to complete the forming job except for the angle; then the part was advanced out of the spindle to a stop. The last operation was the skiving and cutoff job.

To simplify tapping, the spindle was run clockwise (reversed from normal) for all turning so tapping could be done by reversing the lathe back to normal and then the tap could be withdrawn as the spindle (reversed again) rotated clockwise. This allowed advancing the front slide for forming while the tap was being pulled out.

The skiving-tool holder was made from cold-rolled steel, was cut and drilled to fit on the form-tool bolt and to overlap the cutoff tool slightly, and was broached to hold the tool—a 5/16-in. toolbit.

The skiving tool was ground so its cutting edge was skewed to the machine spindle at 45°, which produced a shearing action when it cut. *C. W. Mander, Minneapolis, Minn.*

ADJUSTABLE STOPS on jigs and fixtures can be made by locating two headless setscrews in a tapped hole. Adjustments can be made by loosening the back screw and moving the front one—which extends out of the hole. For places where pounding is heavy, a lock washer inserted between the two screws will serve to hold both screws in place without danger of stripping the threads. The exposed thread can be turned off smooth, if desired. *Roger Isetts, Kenosha, Wis.*



Gravity Line Feeds Parts Past Soldering Iron

SEVERAL THOUSAND small brass assemblies had to be sweated together in as short a time as possible, so we rigged up a sweating line with an electric soldering iron.

A special soldering-iron tip was made from copper. This was a long channel, grooved to let the base part slip through it, with a shank attached which would fit in the iron's receptacle instead of the regular tip. The iron was mounted on a bench at an angle, so the channel was slanted; and two auxiliary channels were cut to match.

The operator dipped the wire part in a mixture of powered solder and flux, assembled the two pieces, and set them at the top of the right-hand channel. Subsequent assemblies, plus gravity, moved the parts off the cool channel and onto the heated one—and finally onto the other cool channel where the assemblies cooled off. The finished parts fell into a stock pan at the left of the line.

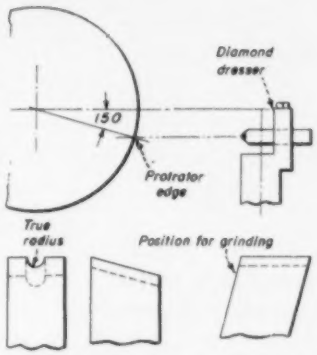
After some experimenting, the depth of dip required for a good joint was determined, and the whole operation proved to be smooth and rapid. *Dan Penway, Carlisle, England.*

A WIRE BRUSH, mounted in a free-wheeling bearing and clamped in a vise, can be rotated with portable belt sander to clean the surface of the sanding belt. Soft materials that clog up the belt can be removed by holding the rotating belt against the brush. Best results are obtained when the plane of rotation of the belt is held skewed to the plane of the brush. *Jerry Lhotka, Milwaukee, Wis.*

Elliptical Forming Wheel Makes Tool Cut Radii

A FORM TOOL with which we were cutting true radii on parts was required to have a clearance angle of 15° and no rake angle. In order to grind the form straight down the front of the tool, it was set up at 15° off the vertical under the wheel. However, in this position a true radius on the wheel would not form a true radius in relation to the top of the tool.

The problem was met in this manner: A protractor was set up against the grinding wheel to indicate a line that went through the center of the wheel and was 15° off horizontal. This was necessary because the wheel-dressing diamond rotated in a horizontal plane. The diamond was elevated to the level at which the protractor crossed the edge of the wheel, and it was set at the required radius. After the wheel was dressed, an ellipse was formed on its surface.



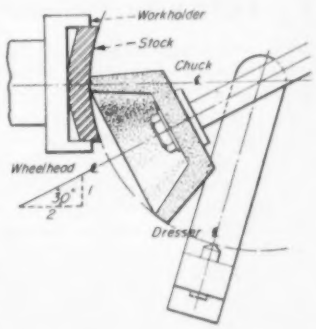
When the tool was mounted under the wheel, an elliptical groove was ground in the end of the tool—but in a cross-section of the tool parallel to its top, this groove was a true circle. The tool was mounted with its top horizontal on the lathe, and the parts were form-cut to a true radius. *R. G. Ware, Hants, England.*

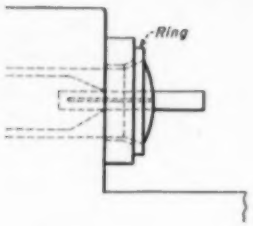
Radius-Grinding Wheel Is Dressed Repeatedly

CUPPED GRINDING WHEELS can be employed for grinding radii in the ends of stock, but the method has a disadvantage in that the cup cannot be dressed—or if it is, the setup must be adjusted to compensate for wheel wear. Such grinding can be done, however, on a universal or cutter grinder where the three centerlines involved—those of the wheelhead, chucking device, and dresser—intersect at the same point. This will allow dressing a number of times while experimental runs are made.

First a cupped wheel with a wide section is selected and set up on a spindle at 30° to the axis of the chuck. The diamond dresser is pivoted directly under the intersection of the two centers, and is adjusted to the required radius. The wheel can be dressed at the edge away from the work, with the wheel carriage advanced to a suitable stop.

After a number of parts have been ground by advancing the wheel to the stop, grinding, withdrawing the wheel, and ejecting the parts; the wheel can be dressed again by moving the wheelhead toward the front of the machine 0.002 in. This effectively moves the intersection of the centerlines 0.004 in. to the right, so the dresser pivot is moved (on a slide) by that amount. *James Emmi, Los Angeles, Calif.*





Collet Ring Allows Centering Adjustments

OUT-OF-CENTER COLLETS can be easily corrected with a steel ring, drilled to almost the diameter of the collet's OD, and then taper-bored to the same angle as the collet.

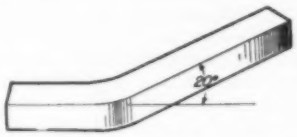
The ring is held in front of the spindle before the collet is assembled, and it remains between the end of the spindle and the collet when the drawbar is tightened. Work can be chucked, indicated, and the ring can be tapped in the right direction with a lead hammer to center the collet.

The ring can be made only ⅛ in. thick, so it need not interfere with the operation of the drawbar. *Thomas Mikito, Chicago, Ill.*

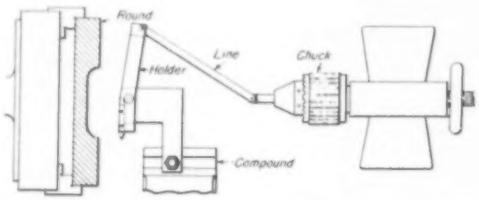
Bent Toolbit Faces Close to Shoulder

ONE WAY of substituting for a right-hand bent toolholder when facing must be done close to a shoulder is to bend the toolbit itself.

A high-speed-steel toolbit can be heated red, bent about 20° at a point ¾ in. from the end, and reheated to cherry red and oil-quenched. The tool can then be



ground to shape and installed in a straight toolholder for both facing and cutoff work. *Edward Diskavich, Torrington, Conn.*



Toolholder Rotated By Links to Tailstock

SMALL RADII can be cut on an engine lathe with a simple, linked attachment that is economical to make. Its simplicity makes it readily adaptable to many variations.

The work in this case was a round plate that had to be dished. An angle block was clamped on the compound rest, and to this was bolted a bent toolholder. The bit was clamped with two setscrews in the short end of the holder, and a link was bolted to the longer end. This link attached to another round link that was chucked in the tailstock of the lathe.

After the tool and rest had been adjusted to the right position for the radius cut, the tailstock spindle was cranked back as the chuck revolved. This rotated the toolholder, which produced the rounded cut. The dish shape was completed by a facing operation. *R. C. Sunderland, Beckenham, England.*

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Hardening Slender Tools

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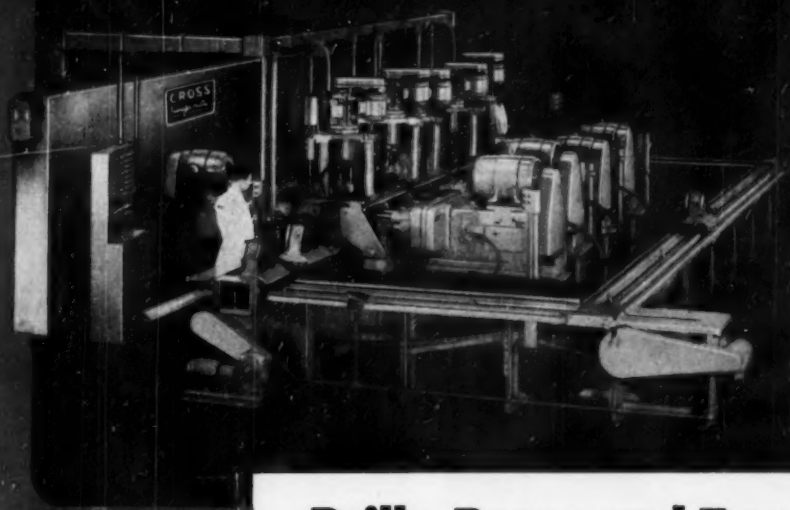

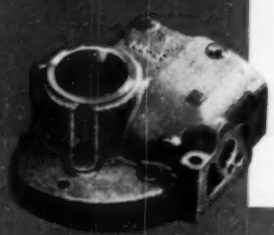

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Heat-Treatment of Gear Steels...I

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Before Machining

Gear-blank forgings should be furnace cooled, or at least buried individually in dry ash or mica, never thrown in a heap. Next, to develop a uniform machinable microstructure, anneal and/or normalize.

To anneal steel, it is heated slightly above the upper critical temperature and held long enough for austenite to form. Then, the material is slowly cooled in the furnace to transform the austenite to ferrite and pearlite, to reduce grain size and increase softness and ductility as aids to machining.

Normalizing is similar to annealing, with the exception that cooling is done in air, and produces higher strength and hardness and less ductility.

Simple annealing or normalizing accomplish desired results for many steels, but are not adequate for higher alloyed materials. Banding, or the formation of alternate layers of soft ferrite and hard martensite, or pearlite, may result. Special annealing treatment is required to avoid reduction of machinability and tool life. This generally involves heating in a salt bath at 1700 to 1900 F, rapid cooling in air or salt to 800 to 900 F, to prevent separation of ferrite from austenite which creates the unwanted banding effect. The steel is held at the above temperature for 1 to 4 hr to produce a microstructure that is readily machinable and gives a good finish.

Final Heat-Treatment

Normally, gears are cut or shaved before hardening. But steels of 0.45% carbon, if properly drawn, can be machined. Typical steels are SAE 2345, 3140, 3250, 3440, 4145, 4340, 4640, 5140, 6140 and 8645. When these steels are used in gears that must have dimensional accuracy and good physicals, the gears are through-hardened and then drawn back to machinable hardness. Approximate machinability ratings for shaving such steels, when tempered to various Rockwell C-scale hardnesses, are given in Table 1.

Casehardening Processes—Methods of casehardening gears are cyaniding, carburizing, flame hardening, induction hardening and nitriding.

Carburizing — Carbon from some contacting carbonaceous material (solid, gas or liquid) is taken into solution by the skin of the gear at a temperature above the transformation range.

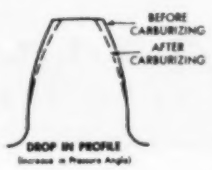
Popular methods of carburizing are: controlled-atmosphere gas furnace, the salt bath, and pack carburizing. Best method for any specific job depends on availability and cost of the carbonaceous medium, depth of required case, degree of uniformity required and production quantities.

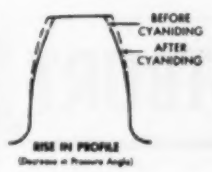
For carburizing, especially large-quantity production requiring the same case depth, the gas furnace is widely used. Case depths of 0.020 in. or more are easily obtained. Natural gas or cracked liquid hydrocarbons are used. On low-carbon (0.10—0.25%) steels heated to 1700 F, gas carburizing will produce a 0.006 in. case depth per hr. Cases of 0.005 to 0.008 in. are produced on medium-carbon steels like SAE 3140, 4140, 4340 and 8640 in 1 to 1½ hr at lower temperature, are quenched and drawn at 300-500 F.

Pack carburizing involves packing the gears in heat-resisting alloy boxes, together with solid carbonaceous material and an energizer like sodium,

Table 1 . . Approximate Machinability Ratings of Gear Steels in Relation to Rockwell C Hardness

STEEL	C-20	C-21-35	C-36-40	C-41-45	C-46-48	C-48-50
Hy-Ten 8-3-X	60%	55%	50%	40%	25%	10%
SAE-4640	45%	40%	35%	25%	15%	None
SAE-8645	40%	35%	30%	20%	10%	None
SAE-4145	40%	35%	30%	20%	10%	None
SAE-3140	37%	30%	25%	15%	5%	None
SAE-4340	35%	30%	25%	15%	5%	None
SAE-5140	35%	30%	25%	15%	5%	None
SAE-3250	30%	25%	20%	10%	None	None
SAE-2345	30%	25%	20%	10%	None	None
SAE-3440	30%	25%	20%	10%	None	None
SAE-6145	30%	25%	20%	10%	None	None





Profile changes are caused by casehardening processes. Left—a drop in profile is brought about by carburizing. Right—Cyaniding and nitriding cause a rise in profile

* Abstracted from "Modern Methods of Gear Manufacture", soon to be published.

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Straddle Broached inside and outside on bosses
Straddle Broached 4 flats
Broach flat
Broach deep slot
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Heat-Treatment of Gear Steels...II

barium or calcium carbonate and heating to 1675 to 1700 F. Penetration rates vary for various steels, but an approximate rule is 0.004 to 0.005 in. per hr. Good practice is a case depth of 1/6 tooth thickness at the pitch line, but it is rarely necessary to exceed 0.070 in.

Liquid carburizing involves heating in an activated salt bath and produces about 0.010 in. case per hr at full heat.

Cyaniding—When gears are heated in molten sodium cyanide, their surfaces absorb carbon and nitrogen to form a hard case. Cyanide is commonly used for medium-carbon alloy steels (0.25 to 0.50% carbon), which are oil quenched and then drawn.

In dry cyaniding, an extremely hard case of 0.007 to 0.010 in. depth is secured by adding ammonia to the carburizing gas. The result is a combination of carbon and nitrided cases somewhat similiar to that produced in the cyanide bath. The process is also called "nitrocarburizing."

Automobile transmission gears are cyanided at 1440 to 1550 F long enough to produce a case depth of about 0.007 in., oil quenched and drawn to produce a Rockwell hardness of C48-C53, and occasionally up to C-58. Steels used are SAE 2350, 4042, 4640, 5135, 5140, 5145, 6160, 8640 or 9440.

Nitriding—In this process, gears are heated to between 930 and 1000 F in an atmosphere, usually ammonia. If any great amount of machining is subsequently necessary, it is advisable to draw at a temperature 50 F above that used for nitriding. Case depths of 0.004 to 0.035 in. may be produced in 10 to 100 hr.

Martempering—To minimize distortion and reduce internal strains, gears are Martempered by quenching to the Ms temperature for the steel (see Table 2), at which martensite begins to form. The gears are held at this temperature for 1 to 10 min., according to size, and then cooled to room temperature. For additional case refinement, the carburized gear is reheated to 1400 to 1425 F and quenched, and finally drawn at 350 to 500 F, if desired.

Distortion—Carburizing, cyaniding, or nitriding, followed by hardening, will change the involute curve and the helix angle. If casehardened after cutting, the amount of change must be compensated for in the cutting and shaving operations.

With carburizing, there is normally a drop in the involute profile (an increase in pressure angle) as follows: 14 to 18 pitch—0.0002 to 0.0003 in.; 8 to 12P—0.0005 to 0.0007 in.; and 4 to 6P—0.0008 to 0.0010 in.

Helical gears tend to unwind, or decrease the helix angle, due to carburizing, per inch of length, as follows: 5 to 10° helix angle—0.0002 to 0.0003 in.; 15 to 20° HA—0.0004 to 0.0005 in.; 25 to 30° HA—0.0006 to 0.0007 in., and 35 to 40° HA—0.0008 to 0.0010 in.

With cyaniding and nitriding, the involute profile tends to rise approximately as follows: 14 to 18P—0.0001 to 0.0002 in.; 8 to 12P—0.0002 to 0.0003 in.; and 4 to 6P—0.0003 to 0.0004 in. But like carburizing, these processes cause helical gears to unwind approximately by the same amounts as given above.

Flame Hardening—This process is applicable to any of the common gear steels having a carbon content of 0.35 to 0.50%. Gas flames are caused to impinge on all tooth surfaces simultaneously, under accurate control, thus heating all surfaces uniformly. When these surfaces have been held at heat for the necessary time, the gear is quenched.

Induction Hardening—Equipment for induction hardening falls into three categories:

1. Motor-generators for frequencies up 12,000 cycles per sec.
2. Spark-gap oscillators for 10,000 to 300,000 cycles per sec.
3. Vacuum-tube oscillators for 300,000 to 1,000,000 cycles per sec.

The number of cycles is based on the job to be done. Depth of case depends on the frequency. With 3,000-cycle current, the minimum practical depth of hardness is 0.060 in.; with 1,000,000 cycles, the minimum depth is 0.010 in. With low-frequency and sufficient time, it is possible to through harden gear teeth, which may be an undesirable condition for the end use involved. Lower frequencies are used for deep cases on coarse-pitch gears; high frequencies for shallow cases on fine-pitch gears. Heating time may range from 0.2 to 120 sec, representing the fastest rate of heating available. It is so fast that gear tooth surfaces remain clean and free of decarburization or scale. Core metal retains its original properties.

Table 2.. Ms Points for Gear Steels to Be Martempered

STEEL	DEG. F.	C.	MN.	SI.	NI.	CR.	MO.	CU.	V.	MS. DEG. F. APPROX.
SAE-1030	1660	0.30	0.75	0.46						665
SAE-1050	1670	0.50	0.91							520
SAE-2340	1450	0.38	0.58	0.29	3.11	0.20				540
SAE-3140	1550	0.38	0.72	0.21	1.32	0.49				470
A-4042	1300	0.43	0.90	0.23	0.23	0.27	0.26	0.07		610
A-4142	1500	0.41	0.86	0.30	0.11	1.06	0.23			590
SAE-4330		0.31	0.66	0.28	1.67	0.72	0.34			550
SAE-4640		0.36	0.63	0.19	1.84	0.06	0.23			460
SAE-5140	1550	0.42	0.68	0.16	0.07	0.93				480
SAE-6140	1550	0.43	0.74	0.23	0.06	0.92			0.16	425
SAE-8642	1550	0.44	0.90		0.45	0.54	0.22			585
SAE-8749	1500	0.52	0.85	0.21	0.53	0.50	0.26			540

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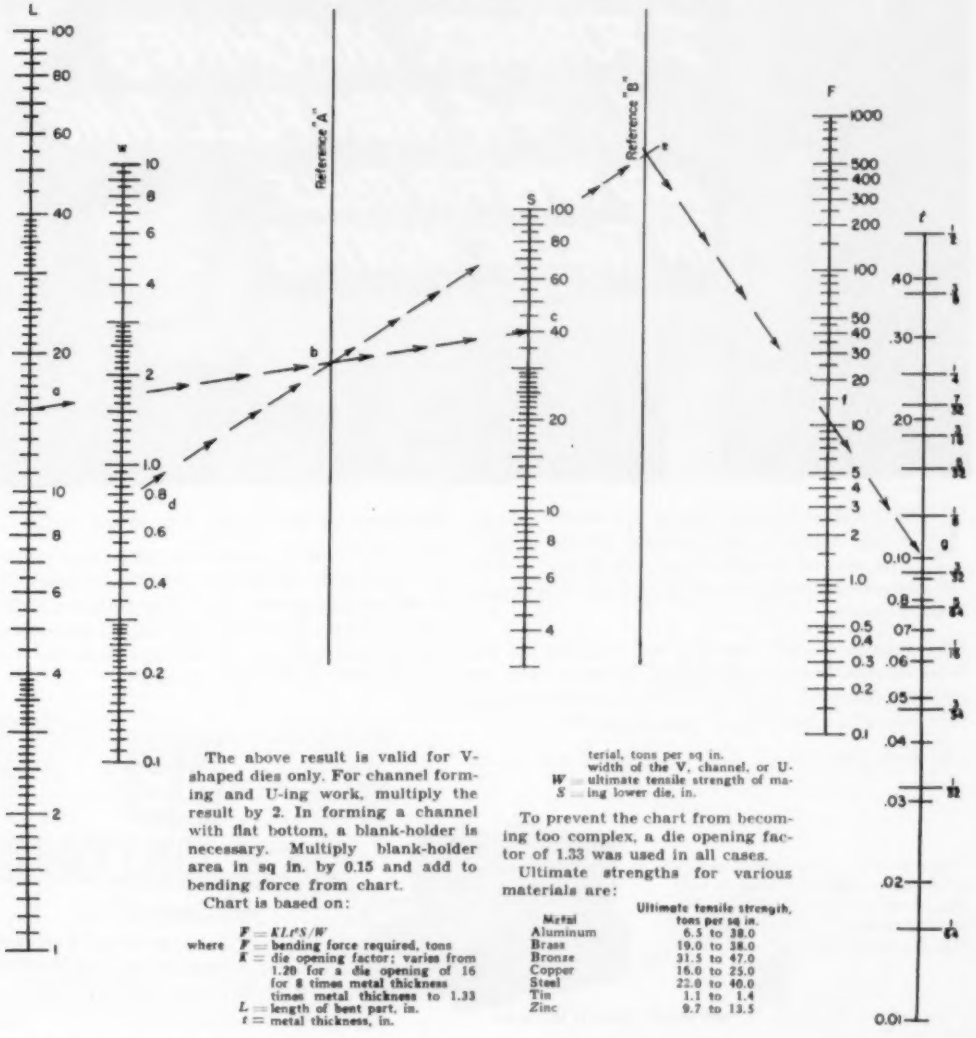
Estimating Bending Press Capacity

BY TYLER G. HICKS

To select a suitable press for bending or forming jobs, find the force necessary to do the work with this chart.

Example: A 15-in.-long, 0.10 in.-thick, ¾-in.-wide steel strip is to be bent in a V-shaped die. What bending force is necessary if the steel has 40-ton tensile strength?

Solution: Enter chart at 15 in. and draw line, *abc*, through 40 tons per sq in. ultimate tensile strength. Next, draw a line, *dbe*, through 0.75 in. die width and the intersection of the first line with reference axis *A*. Prolong to intersect reference axis *B* at *e*. Connect point *e* and 0.10 in. metal thickness, *efg*. At *f* read bending force as 11 tons.



The above result is valid for V-shaped dies only. For channel forming and U-ing work, multiply the result by 2. In forming a channel with flat bottom, a blank-holder is necessary. Multiply blank-holder area in sq in. by 0.15 and add to bending force from chart.

Chart is based on:

$$F = KLt^2S/W$$

where F = bending force required, tons
K = die opening factor; varies from 1.20 for a die opening of 16 for 8 times metal thickness times metal thickness to 1.33
L = length of bent part, in.
t = metal thickness, in.
S = ultimate tensile strength of material, tons per sq in.
W = width of the V, channel, or U-ing lower die, in.

To prevent the chart from becoming too complex, a die opening factor of 1.33 was used in all cases.

Ultimate strengths for various materials are:

Metal	Ultimate tensile strength, tons per sq in.
Aluminum	6.5 to 38.0
Brass	19.0 to 38.0
Bronze	31.5 to 47.0
Copper	16.0 to 25.0
Steel	22.0 to 40.0
Tin	1.1 to 1.4
Zinc	9.7 to 13.5

A Typical Case of New Britain "AUTOMATIC" ECONOMICS

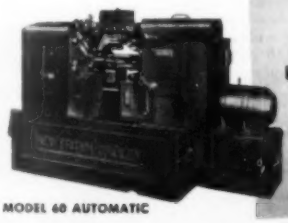
UNTIL this manufacturer invested in a New Britain six spindle automatic, work on small pistons involved four men and two turret lathes. Hit or miss accuracy and time-consuming hand operations to finish a critical taper boosted his costs.

Now the one automatic has freed the four men and two lathes for other work. It requires only half the time of one regular operator and delivers up to 465 completed pieces per hour, with a "smooth and true" taper as specified.

The direct labor savings alone are justifying the machine investment, paying for the New Britain within a year!

No manufacturer can afford *not* to invest in a machine that can lower production cost per piece. Obsolescence, not wear, is the determining factor in machine replacement. The current trend toward over-age machinery is endangering not only the profit picture in the individual plant, but the safety and prosperity of the whole nation.

"It Can Be Done", a brochure of up-to-date cost histories on specific pieces, points the way. May we send you a copy? Call in your New Britain Sales Engineer for help in discovering profit opportunities in your shop's metalcutting.



NEW BRITAIN MODEL 60 AUTOMATIC

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NEW BRITAIN, CONNECTICUT

450 HC1

TALKING SHOP

Shuttle Trouble

ED PETERSON, a Swedish engineer long resident in this country, recalls working in a plant in Sweden in 1904 that made an exact duplicate of the Singer sewing machine. They reproduced the parts exact to "tenths"—with one exception: The Singer people had a patent on the shuttle, so it was necessary to alter this part slightly. The foreman had worked in the Singer plant at Elizabeth, N. J., for a while first, but Singer was inconsiderate enough to fire him when executives learned the reason he was there . . . Reminds us of the Japanese machine tools that Fred Colvin saw that were exact copies of American machines, even to the name cast in the frame.

Ram Truck

GREAT LAKES STEEL CORP. has purchased from Automatic Transportation two Giant ram trucks capable of handling 60,000-lb. coils of steel. The machine is 182 in. long, plus a 78-in. ram. Coils can be lifted from 14 in. off the floor to a height of 100 in. at 5.6 fpm and carried off at 3 mph. It makes possible handling at almost ten times the speed of a decade ago.

Tale of Woe

A GOOD-SIZED METALWORKING CONCERN recently installed a conveyorized painting setup that works perfectly and achieves just such savings as the management hoped it would. But nobody thought of the loose dust which flies in the plant, so no provision was made to provide dust catchers or exhaust fans. So now there's trouble with dust on finished parts.

Grinder Size Control

AN AUTOMATIC SIZE CONTROL has been put on a Besley double-spindle disk grinder by adopting a Sheffield Airlectric control. Two carbide anvils, one fixed and one reed mounted, actuate an air jet. Change in the air flow beyond set limits produces electrical impulses which, through a control box, operate the feed on the grinding wheels. The system can be adjusted to advance the wheels either simultaneously or alternately, depending on the job. Because the gaging unit cannot check the size until several parts have been ground, a timer sets an interval between adjustments to prevent over-correction. In grinding bearing races and thrust washers, the gage is holding size to ± 0.0005 in.

Tool Dolly

FOR WORK IN RADIOACTIVE AREAS, a one-armed robot on wheels developed by GE will operate doors or valves, take apart or reassemble complex machinery, and do similar operations. The dolly runs along narrow-gage tracks, with power and control (from an adjacent shielded room) provided through six shielded cables carrying 25 conductors. Weighing about five tons, the unit looks like a railroad handcar with a deck gun, the "gun" being a telescoping arm equipped with double clamps like the artificial hands used by amputees. Two dozen motors, six in the arm and hand alone, make possible wrist-bending, rotation and gripping motions, so closely controllable that a dime can be picked up from the floor. In addition to the hand, the dolly carries a hydraulic ram capable of a 4-ton push, and various rotative devices and special attachments. A 3-ft mirror, high on the carriage and controllable from the remote point, enables the operator to see things behind the machine. There are also "feelers" for the rotative attachments to assure proper centering.

Journalese

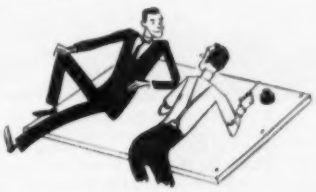
A RECENT STORY submitted to us by a good newspaper reporter with no engineering background included these gems: Some jobs are completed in a few days; others take months . . . The chief of the fabrication division and his staff must not only produce the parts, but also determine how they are to be made . . . The shop superintendent not only selects the men to do the job, but also determines what machines to use . . . Reasons why workers stay on these jobs is the pride of workmanship *which is constantly hammered into their minds by the shop management* . . . They work with fine tools and wires the size of a hair . . . It is a pretty exciting place for all the employees . . .

Which reminds us that "The American Observer," in describing careers for tomorrow, makes this distinction: "The duties of a toolmaker differ somewhat from those of the die maker. The latter shapes the machinery or dies for making tools. The toolmaker uses these dies for turning out the finished implements required by industry."

How simple some things are to the uninitiated.

Postscript on Ford

IN 1904 AND 1905, Ed Peterson made a tour of the U. S., financed by the Swedish Government, to study production methods. When he applied for a job at Ford (which then had about 300 workers) he was asked to wait a minute. While he was waiting, a strange man came out and gave him a keen look; then the superintendent returned and gave him a job. Turned out the stranger was Henry Ford. Peterson says that after that he saw Ford nearly every day and there was always a smile and a kind word from him. One day, while Peterson was working on the differential for a racing car, Ford crawled up on the drawing board and rested for about 15 minutes. We're sorry we can't report on whether he chose his position so that the designing would not be interrupted.



NEWS OF METALWORKING

Machinery Wages Up

Wages went up in about two-thirds of the country's machinery manufacturing plants last year.

In most cases, the rise was less than 5%. The Bureau of Labor Statistics has just issued a survey of average wage rates paid last November in 28 cities for work in machinery plants.

To O.K. Maritime Change

Odds are that the Hoover Commission plan to reorganize the Maritime Commission under the Commerce Dept. will be approved without changes.

Commissioners themselves won't buck it; they hope to be transferred along with the USMC. No one in the steamship industry seems inclined to fight the move.

Tighter Controls on Exports

Dept. of Commerce's Office of International Trade last month slapped even tighter controls on a long list of U.S. Exports.

Object is to stop completely the flow of critical goods going to Russia through round-about routes. Definition of so-called "R" commodities has been changed. Before, "R" commodities required export licenses for export to Europe only. Now, to export "R" commodities to anywhere in the world outside the Western Hemisphere, an export license is needed.

Steel Projectiles Produced by Cold Extrusion

Scrap Reduced to Less than One Pound per Projectile, Compared with Six to Twenty Pounds in Forging

CLEVELAND—Cold extrusion of steel has now been successfully used in the production of 105-mm howitzer projectiles weighing 35 lb. The cold working involved makes it possible to use low-carbon, low-manganese steel and still get the physical properties required. Previous methods required a high-manganese steel.

The finish obtained directly from the dies is superior to that obtained by turning or even grinding and the number of machining operations is reduced to three.

Col. Merle H. Davis, chief of the industrial division of the Ordnance Department revealed these facts at a symposium held here by the Pressed Metal Institute. Scrap, which ran from 6 to 20 lb per projectile in forging, is reduced to less than 1 lb by cold extrusion.

Although many different parts have been produced by cold extrusion by several contractors, so far work has been limited to hollow cylindrical shapes for ammunition, Col. Davis said.

In producing cartridge cases by cold extrusion, it is possible to start with bar rather than plate as required for drawing. First work was along this line by Heintz Manufacturing Co., Philadelphia.

Mullins Manufacturing Co. is making the 105-mm projectiles and has a contract to try the 95-lb, 155-mm shell. This, and the 4.5-in. rocket, will be done in a new 3000-ton hydraulic press with long stroke and an unusual range of speeds and pressures built by Lake Erie Engineering Co.

Other companies which have been, or are now, working on cold extrusion for the Ordnance Department are Stoner Manufacturing Co., Worcester Stamped Metal, Metroloy Corp., Norris Stamping and Manufacturing Co., Curtiss-Wright, and AC Spark Plug. Frankford Arsenal and National Machinery Co. are working on extrusion of caliber .50 steel cartridge cases.

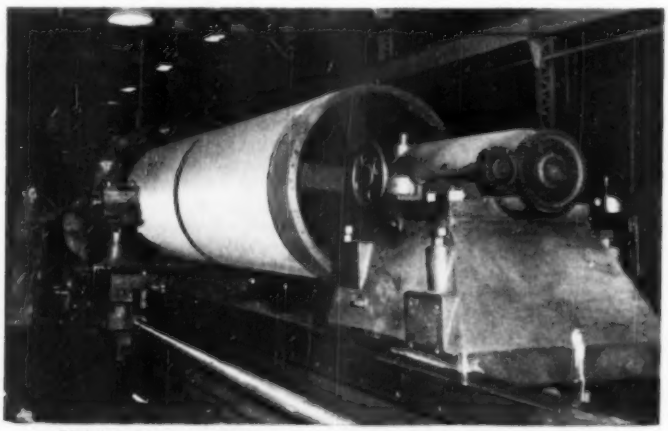
Substantial economies can be made by cold extrusion of steel in making thick-walled parts, such as projectiles, and by a combination of cold extrusion and subsequent drawing for thin-walled parts, such as cartridge cases.

However, Col. Davis pointed out, widespread use of cold extrusion for military purposes will depend upon the extent to which commercial applications are developed so that presses which have the necessary long stroke and accurate alignment, and firms that have the operating knowledge necessary, will be widely available in an emergency.

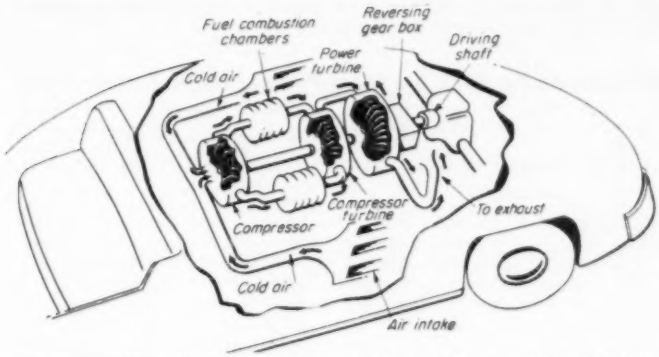
General feeling at the symposium seemed to be that commercial application of cold extrusion is not far off. The lubrication for cold extrusion of steel is provided by phosphate coatings. Processes for this have been developed by Pennsylvania Salt Mfg. Co. and Parker Rust Proof Co.

Heintz reported that so far fatigue life of dies has been about 2000 pieces, but these dies were not designed for long life. There is no real data yet on what die life can be expected in cold extrusion.

Technical information now available on the process will be included in a special report on extrusion to be published in AMERICAN MACHINIST next month.



TURNING THE GROOVES in a giant hoist drum at Cleveland Crane and Engineering Co., Wickliffe, Ohio. Made of a solid one-piece steel casting, the drum is 15 ft long by 48 in. dia and weighs 23,300 lb. It will lift 200-ton loads. This big hoist drum will be used on a Cleveland crane in a power house.



THE POWERPLANT, located behind the driver, looks something like this in the . . .

Gas-Turbine Automobile Demonstrated by British

Rover Co. Proves Car Is Practical, With Advantages Over Today's Models; But You'll Wait Three Years For It

By FREDERICK R. BREWSTER
London Bureau
McGraw-Hill World News

The gas-turbine powered automobile is coming. But not just yet.

The British have now proved the technical practicability of operating an automobile by a gas turbine engine. The Rover Company Ltd., of Birmingham, a medium-sized auto manufacturer, demonstrated at Silverstone, Northamptonshire, England, on March 9, what is probably the world's first such car. But it was an experimental model, purely, and Rover officials were the first to admit that it will be some time yet—at least three years and possibly longer—before you can buy and drive one.

The demonstration showed that a turbine-powered car will probably give you smoother running, vibrationless power; the engine will have less mechanical wear and hence lower repair bills. It won't give instant get-away, but it will accelerate to top speed faster than today's conventional cars.

The engine in the experimental car has been placed in the rear portion of a standard Rover chassis, just in front of the rear axle, and the compartment "faired over" to give a racey-look. This arrangement was used purely for convenience; in a later stage the engine will almost certainly be placed in front, in the normal position.

Air intakes are in the side of the body, just back of the car's front doors. The rest of the engine layout is suggested by the sketch on this page. This traces the air flow from the intakes to the single-sided centrifugal compressor, and from there to the two combustion chambers where the fuel (kerosene, ordinarily, but gasoline could be used) is injected and burns.

Hot gases then drive two independent turbines; the first of which drives the compressor, the second of which is direct-connected, through reduction gears (about 6 to 1) to the drive shaft, which in turn drives the rear wheels of the car through a standard rear-axle differential gear (about 3 to 1 ratio).

Not all the hot gases are effectively absorbed by the turbines, in the experimental model. A heat exchanger, certainly, will be incorporated in the final version, just as in present-day industrial gas turbines, and this will cut the fuel consumption by half or two-thirds from the demonstration's optimistic estimate of 12 miles to the Imperial gallon of kerosene to 20 when the heat exchanger is added.

Exhaust gases, after leaving the second turbine, are expelled into the air through louvres in the upper surface of the rear body fairing. The exhaust temperature is not much more than that of a conventional piston engine, now, and when the heat exchanger is incorporated, will be lower than that of present-day automobile power plants. Thus, no damage to the highway will be done and no danger will be presented to following cars or to pedestrians who cross close behind.

How the car starts: An ordinary electric-motor starter turns over the compressor until it reaches about 7000 rpm, at which point the fuel ignites. This takes perhaps 10 to 12 seconds. To move away, simply increase the fuel supply by stepping on the throttle. There is no clutch.

A simple forward-reverse lever, located in the steering column, engages or disengages the reverse gear—just as in present-day automatic transmission arrangements.

The second turbine, independent of the first, is the key to the use of gas-turbine powerplants in road vehicles.

Road vehicles need high torque at low speeds—when starting up, climbing hills with heavy loads, etc. A gas turbine can deliver high torque at low speeds, but the compressor absorbs almost all that torque if operated at low rotor speeds, and there is little left for the driving axle. Consequently, a single-turbine unit would not do for road vehicles.

In a two-turbine system, however, the compressor-turbine can be operated at its efficient speed entirely independent of the vehicle's speed. And the independent (second) power turbine, running on its separate shaft, can then develop its normal high torque even when the vehicle is operating at low speed and with a heavy load. At full charge, the torque may be almost twice that delivered at maximum running speed. The independent turbine operates with the same effect as a fluid-drive torque-converter—speed varies with the load.

Here Are The Specs

Speed—90 mph; Brake horsepower—100; Acceleration—60 mph in 14 seconds from standstill (engine idling). Turbine engine is 34 in. long, 20 in. high, 18 in. wide. Weight of engine—475 lb. Wheelbase is 111 in.; Tread—52 in.

PARTS FOR HYDRO ELECTRIC power units being handled by overhead traveling crane. Scene is of "Ivo-Lola Ribar" machine tool factory at Zeleznik on outskirts of Belgrade

After a two-month tour in Yugoslavia for AMERICAN MACHINIST and other McGraw-Hill publications, John J. Christie, our correspondent in Germany, has returned to his Frankfort home base to file this

Exclusive Report on Metalworking in Yugoslavia

Tito Finds Tough Going in Developing Industry Under Ambitious Five Year Plan; Many New Plants are Prototypes

BELGRADE, Yugoslavia—Developing metalworking industries is a disheartening proposition for the Tito regime, especially in terms of its ultra-ambitious Five Year Plan.

Financial assistance from the West isn't going very far in this direction. Instead priority is being given to rehabilitating and developing non-ferrous mining, forestry and agriculture, these industries affording the best and quickest means by which Yugoslavia can improve its foreign exchange position.

Equipment for establishing metalworking and other forms of semi and finished goods production will have to be procured chiefly out of foreign exchange earnings. Britain and western Germany will be Tito's biggest trading partners because they can take the biggest share of his narrow range of volume exports in exchange for capital goods.

Total Yugoslav exports to the U. S. in 1949 were valued at only $17,612,471, of which $14,037,922 represented non-ferrous metal shipments. Exports may reach $20 million this year. But due to demand for critical raw materials and emergency-type needs for existing industry, it's not likely that much will be spent for equipping new factories.

Progress in establishing new basic industry has been slowed considerably by the blockade imposed against Yugoslavia by the Cominform countries as a result of Tito's break with the Kremlin. Fifty percent of Yugoslavia's postwar foreign trade was with the eastern bloc.

Most crippling aspect of the blockade was the fact that Russia, Hungary and Czechoslovakia cancelled long-range contracts for capital goods amounting to 20 billion dinars ($400 million at official rate of exchange), of which only a billion dinars worth had been sent.

Productivity capacity established since the war falls into two categories:

1. Expansion of steel, foundry and rolling mill capacity, and 2. Establishment of plants for manufacture of basic requirements like construction and agricultural machinery, locomotives and rolling stock, turbines and pumps, small electric motors, etc.

The new plants are not yet really mass producers. Some are hardly out of the prototype stage. Furthermore, they are utilized to a large extent as general workshops turning out whatever can be made to meet an urgent need.

A feverish effort is being made to generate the native know-how required for industries. Each new factory has a trade school and apprentice training program. At some places, up to 70% of the workers are peasants coming directly from farms and villages.

Here Are Major New Yugoslav Plants

Here is a thumbnail sketch of major Yugoslav enterprises developed since the war:

1. Steel works at Sisak on the Sava River. There was just a small insignificant blast furnace before the war. A blast furnace of 150 tons capacity went into operation in November. Pig iron is now only output. But open hearth furnaces and seamless steel producing units are under construction. The power plant came from German reparations.

2. Steel plants at Zenica in Bosnia. This, too, is virtually a new enterprise, replacing a small pre-war plant. Three new open hearth furnaces have been built and two Siemens-Martin furnaces installed. A good part of the expansion at this plant as well as some others has been undertaken by Murdoch MacKenzie Engineering Co. of Britain, with a $20 million contract. Zenica's forging plant was formerly that of the Ruhr's big Haniel & Lueg heavy machine tool plant. A blooming mill is on order from Continental Foundry and Machine Co. of Pittsburgh.

3. Jesenice steel plant in Slovenia has a new rolling mill for medium and heavy plate. Except for the motors from Italy, it is reported to be of domestic construction.

4. Jasdrebac near Nis on the Yugoslav-Bulgarian frontier, now has a foundry and is producing for the mining industry.

5. Pobeda (Victory) agricultural machinery plant at Novi Sad. Production started with binding and mowing machines. Hungary welched on an agreement, which was part of its peace treaty settlement, to supply equipment for a complete factory of this type.

6. The Litostroj plant at Ljubljana, the capital of Slovenia, for production of turbines and pumps is the pride and joy of the Tito regime. One reason is the emphasis placed on electrification. The plant is reported to have turned out 19 turbines with total capacity of 95 million kilowatt hours in 1949.

7. The Rade Koncar plant at Zagreb is devoted to production of small electric motors, generators, switchgear, etc. It was built partly with reparations equipment.

The machine tool factory at Zeleznik on the outskirts of Belgrade—the "Ivo-Lola Ribar" factory—of which this correspondent made a detailed inspection, mirrors accurately the Yugoslavs' determined struggle to attain industrialization. Opened New Year's Day 1948, the main factory buildings, reasonably modern, were constructed of stone in seven months by volunteer youth labor brigades. An estimated 70% of the equipment in the factory is reparations from Germany.

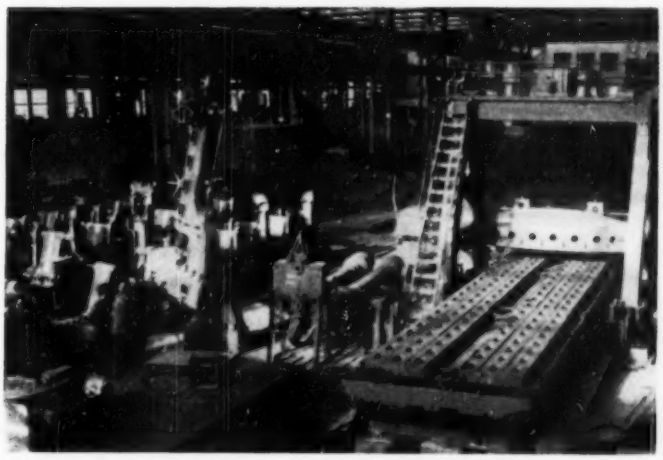
Though established as a machine tool plant, the factory is just as important, if not more so, as a general workshop or, as the Yugoslavs say, as a "mother" factory for equipping other new installations. It has produced parts for rolling mills, hydro power units and even naval vessels. Its line of machine tool production presently is limited to small and medium presses and grinding machines. A wider range of machine tools, of course, is planned.

Directors of key enterprises, both mine and factory, are appointed by the central government. They are chiefly figureheads, often war heros and in any case good party men. However, available technical talent is well organized and carefully distributed at the operational level.

Yugoslav government officials claim attention is being paid to the cost factor. They admit their costs are too high but can point with some justification to adverse factors responsible. They're not worried about the actual price angle, of course, because they aren't manufacturing finished goods and internal prices present no problem in an economy such as this. But they are concerned about productive efficiency insofar as it affects their expenditure of manpower and their own urgent need for greater output.

Aside from a comprehensive piece rate and bonus system for the workers, each factory attempts to build up what is known as a "Fund of the Management." This actually represents the plant's "profit," and a portion of funds gained thereby are distributed as premiums to the management and the workers. It works this way: A cost of production figure per unit is proposed by the plant directors and must be approved by the authorities responsible for the particular industry. If the plant produces under the agreed production cost, the difference is the profit.

The Tito regime is in the process of decentralizing authority over industry. It is attempting to divorce the functions of planning and operational control. The planners are to remain in Belgrade. The others are to be assigned to the governments of the republics or even down to districts. The move is aimed at cutting the red tape involved in centralized bureaucracy.



MACHINE TOOLS, ready for shipment, are shown here on the left, in another "Ivo-Lola-Ribar" scene. Tis factory is a "mother" plant which will turn out equipment for numerous other plants being built in Yugoslavia

Management Needs Specialists On Equipment Replacement

NEW YORK—Present methods of equipment replacement are "extraordinarily primitive," and there is a pressing need for an adequate technique of analysis to appraise replaceability of equipment, George Terborgh, Machinery & Allied Products Institute research director told the National Industrial Conference Board members meeting here March 23.

He proposed employment of specialists trained in replacement to review equipment proposals of production executives as well as to originate proposals of their own, to show what it costs not to replace obsolete equipment, to point out anticipated savings, and to supply equipment recommendations to management as a comprehensive program with over-all estimates for the plant rather than one-at-a-time proposals.

Drop in Exports to Russia

WASHINGTON — U. S. exports of machinery and vehicles to Russia have practically come to a halt. Last year the Soviet bought less than $500,000 worth.

This compares with figures for 1948 of $23 million, and for 1947 of $109 million.

Cut in Maritime Funds

WASHINGTON — The Maritime Commission seems destined to take a beating on its requests for 1951 funds. USMC is asking for $164.7 million, more than twice the $74 million it got for the current year.

The omnibus appropriations bill of the House Appropriations Committee recommends the Commission get $96.1 million. The cut in contract authority isn't so bad. USMC is asking for $70 million; the Committee bill cuts it to $63 million.

Trend Toward Guided Missile

WASHINGTON—The trend in future naval ship construction will emphasize the guided missile, both for anti-aircraft work, ship-to-shore, and ship-to-ship bombardment.

Today, with weapons now in use or about to be ordered, the rifled projectile still has an edge over the missile in ground-to-air combat, but this is a period of transition. A year from now it will be the other way around. Plans and strategy are based on this fact.

Detroit

AUTO SALES MAINTAIN HIGH PACE . . . BOOTLEGGING CONTINUES
WILLYS SHOWS RADICALLY NEW 4-CYLINDER F-HEAD ENGINE

Another torque converter transmission is rumored in final development stages by Borg-Warner Corp. and its Long Mfg. Div., Detroit. Long is now getting into production on the Studebaker unit, and is doing advanced engineering on variations about broad enough to classify as a new type. Borg's Warner Gear Div., meanwhile, is said to be making some notable engineering changes on the transmission job being set up for Ford.

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Newest engine development: Ford is reported about ready to make releases on a new powerplant for 1951 model appearance. Details are as yet unknown. Chrysler, too, is supposedly a good way along on new engines for next year.

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Auto sales continue terrific. Mercury reported volume at new all-time record heights for any 10-day period during the first third of March—the second consecutive 10-day period this had happened. Buick sales during the first 10 days of March were 61% greater than 1949—another record. The same is true for many others.

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Bootlegging is the favored topic of conversation in automobile sales circles. Meaning: Cars which drift out of the hands of authorized dealers into the hands of fly-by-nighters who undersell the regular dealers. It happens this way—a dealer finds himself overstocked (because, for example, of strikes in his vicinity, or because he ordered too many cars to get a volume discount). He sells the cars at his wholesale cost. The buyer drives them a couple of hundred miles away, sells them off a lot for a quick, short profit.

The customer takes his chances on service and guarantee, but saves himself several hundred dollars. The dealer in the locality where the sale was made screams loudly. There has been plenty of bootlegging this winter; it happened all the time before the war; everybody blames everybody else but nobody has ever found a way to do much about it.

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Unqualified company victory—that's the way to interpret the final details of the pension agreement between Ford and the CIO United Auto Workers. The UAW backed down completely on its position that Ford was guaranteeing 8¾ cents an hour toward pensions for the 5-year life of the contract. Instead, Ford will put in the 8¾ cents, but only through 1950, and only by mutual understanding, not contract obligation. After that, payments depend upon need.

But there is a gimmick in the arrangement in favor of the union—a quid pro quo. Any time social security goes up and reduces the need for company payments, the company must advise precisely how many cents per hour are saved. That leaves the way open for the union to make new wage demands.

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Aiming for price position, Studebaker has introduced a stripped-down model of its Champion line, tagged under the regular series. Eliminations: Hood ornament, bits of exterior chrome, interior styling touches. Result: A car almost indistinguishable from its fancier brothers, priced $75 lower.

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The high compression engine builders have been joined by Willys-Overland. That company's new models, introduced the end of March, are powered with a choice of 2 engines—a 4-cylinder F-head design departing radically from orthodox American engine stylings, with compression ratio of 7.4:1 with 72 hp output at 4000 rpm. The Willys Six, a more conventional L-head type, has compression ratios 6.9 to 1, develops 75 hp at 400 rpm.

WILLYS F-HEAD "Hurricane" 4-cylinder engine, developed under direction of Delmar G. Roos, first vice president. Engine has enlarged intake valve in cylinder head, with exhaust valve remaining in cylinder block

New Tooling

AUTO INDUSTRY HAS IMPORTANT ORDERS COMING UP
EXPORT SITUATION DOUBTFUL IF ECA FUNDS ARE CUT

Prospects are for good machine tool business in second quarter. Automobile industry has lush orders coming up. Ford, for one, is on verge of distributing initial contracts for machine tools for its proposed engine plant at Cleveland. These will be for heavier types which take long time to build.

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One of big automobile companies plans to spend at least $300 million, and perhaps much more, for new production equipment, including new tools and dies, during 1950 and 1951. This program is on larger scale than any time since end of war.

Builders of special-purpose machine tools are benefiting handsomely from automotive buying. Some are sold out for 1950 and into early part of next year. But machine tool purchases by Detroit are not confined to special machines. They are spread over much larger area.

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Machine tool sales are holding up very well. February was down, it is true, from January. But both February and March new orders were far above level which prevailed during entire second half of 1949.

This upsurge in machine tool business should not be interpreted as meaning that everything is fine. Activities are not uniformly good throughout the industry. Most worrisome factor is exports. They still are substantial portion of total (20% in February). But ECA funds for fiscal 1951 are in doubt; and foreign sales of machine tools are in direct proportion to amount of ECA financing.

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Builders of machine tools in ECA countries can make deliveries on much shorter notice than they could even six months ago. List of delivery dates has been compiled by OEEC in Paris. It shows: lathes of various types available in one to four months in France, United Kingdom and western Germany; milling machines in one to six months; grinding machines in one week to three months.

• • •

New Franco-German trade agreement provides for quota of $1.3 million of machine tools to be imported into France from Germany in first six months of 1950. Agreement probably will be extended. French colonies are to get $120,000 of German machine tools. France has privilege under agreement of selling all types of machinery in Germany without restriction.

These German products may be sent freely into France now: machines for milling, brewing, paper making, knitting; steam engines, hydraulic turbines; tractors and some farm machinery.

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Indian government will not issue import licenses for any types of production equipment built in India. German machine tool builders are quoting immediate delivery to Indian users.

NEW MACHINE TOOL ORDERS DOWN FROM JANUARY HIGH MARK

New Orders (Total)	87.0	80.9	93.5	70.1	63.7	53.6	48.0	51.5	57.7	56.8	84.3	82.5	99.7	p88.7
Foreign Orders (Incl. in Total)	21.9	26.5	22.3	23.1	15.9	15.7	14.0	18.8	13.7	13.7	17.1	22.4	26.7	p18.8
Shipments (Total)	68.8	70.3	75.8	74.9	72.8	79.0	60.7	67.5	67.6	62.3	68.0	75.7	52.8	p55.8

Data: NMTBA

p—preliminary figures

William E. Moody

George F. Jenkins

Walter K. Bailey

Lloyd D. McDonald

Names in the News

William E. Moody has been named manager of sales engineering, Bay State Abrasive Products Co., Westboro, Mass. Before joining Bay State he was with American Steel & Wire Co., Worcester, Mass., for 11 years, serving as chief inspector in the cold rolled steel section. Since 1943, until his present promotion, he has been abrasive engineer with Bay State.

J. Allison, formerly of A. C. Geldner & Co., has been named sales representative for Oregon and Washington by Titan Metal Mfg. Co., Bellefonte, Pa.

Robert P. Merritt and **Ernest W. Smith, Jr.,** have been elected president and executive vice president, respectively, of Hartford Special Machinery Co., Hartford, Conn. Mr. Merritt succeeds his father the late **Joseph Merritt,** one of the original founders of the company. Other officers elected: **William H. Storrs,** vice president in charge of engineering; **Raymond J. Dunn,** secretary and treasurer, and **Edward J. Sanderson,** assistant treasurer and comptroller.

George F. Jenkins has been named sales manager, National Screw & Mfg. Co., Cleveland. He has been industrial sales manager of National since 1948. He succeeds, in active sales direction, **B. H. Jones,** vice president of sales, who under that title will continue in an advisory capacity in sales activities of National, its California subsidiary, and divisions including Hodell Chain Co., Cleveland, and Chester Hoist Div., Lisbon, Ohio.

D. M. Hood has been named manufacturing engineer, General Electric fan division, Bridgeport, Conn. **Louis P. Pack** has been named sales manager, industrial vacuum cleaners, at Bridgeport.

John Lawrence has been named to the newly created post of technical vice president, SKF Industries, Inc. He will have charge of all manufacturing, engineering and research operations in the firm's plants in Philadelphia and Shippensburg, Pa., and Hornell, N. Y. He joined SKF in December, 1944, as factory manager after serving in a similar capacity at Jones & Lamson Machine Co., Springfield, Vt.

Lloyd D. McDonald has been named to the newly created position of executive vice president, Warner & Swasey Co., Cleveland, and **Walter K. Bailey** has been elected vice president in charge of manufacturing. Other company officers were reelected. Mr. McDonald, who joined Warner & Swasey in 1918, was president in 1949 of the National Machine Tool Builders Assn. Mr. Bailey, like Mr. McDonald, has been a vice president for many years, joining the company in 1919.

H. F. Hagenauer has been named purchasing agent, Ahlberg Bearing Co., Chicago. He succeeds **P. F. McGuinn** who died in November, 1949.

Franklin Farrel III has been elected executive vice president, Farrel-Birmingham Co., Inc., Ansonia, Conn. **Joseph LeMay** was elected secretary and assistant treasurer and **Mrs. Williford Whiteside,** assistant secretary. All other officers and directors were reelected. Mr. Farrel joined the company in 1933. In 1941 he was named assistant manager of manufacturing, and in 1943 was appointed plant manager of the Ansonia-Derby plants. The following year he was elected assistant treasurer, and in 1945 became assistant to the president and secretary of the company.

Robert P. Merritt

Ernest W. Smith, Jr.

John Lawrence

Franklin Farrel III

Arthur Templeton has been appointed to the sales engineering staff of Templeton Kenly & Co., Chicago. A son of the company's founder, he has served for the past four years in the production dept. He will cover the Chicago territory.

Thomas D. Hogg has joined Control Engineering Corp., Canton, Mass., as plant manager. He was formerly with Chandler Evans Corp., South Meriden, Conn., as factory manager. Previously he was associated with Accurate Tool Co., Detroit, as factory executive and with Zenith Associates, Newton, Mass., as production manager.

Carl L. Sadler, Jr., has been named chief engineer, Hydraulic Div., Sundstrand Machine Tool Co., Rockford, Ill. He has been with Sundstrand for two years, serving as assistant chief engineer of the Hydraulic Div. Previously he was a group engineer in charge of control and accessory developments for Aviation Gas Turbine Div., Westinghouse Electric Co., in Philadelphia.

Otto G. Schwenk has been elected to the board of directors, Yale & Towne Mfg. Co., New York. He succeeds the late **F. Carroll Taylor.** Mr. Schwenk has been serving as vice president in charge of production since Sept., 1948. He went to Yale & Towne from Cleveland where he had been assistant to the president of Weatherhead Co.

Herbert A. Stanton, vice president and general manager, Foreign Div., Norton Co., Worcester, Mass., has been re-elected a member of the National Foreign Trade Council, Inc.'s board of directors for a third consecutive two year term. **Wilfred R. Ogg** has been named sales representative for northern New England, Norton's Grinding Machine Div. **Howard P. Chace** succeeds Mr. Ogg in charge of the sales engineering.
(Continued on page 244)

THESE SIX MEN have spent all their lives together from school days in Hoganas, Sweden, to the ranks of retired employees of Norton Co., Worcester, Mass. Oke Cook is shown locating his name among the 25 Year Club members. The others, from left to right: Axel Fernberg, Algot A. Sandine, Anton E. Olson, Harold Pearson, and John Anderson. In 1891, all six were in the same new class of 6-year-olds. Later, all six came to America at about the same time, though they came individually. Total service for the six men is 240 years

Plant Expansions

Landis Tool Co., Waynesboro, Pa., has acquired the outstanding stock of Gardner Machine Co., Beloit, Wis., according to an announcement by S. F. Newman, chairman, Landis Tool Co. Gardner will continue to operate as a separate company, with all manufacturing operations continuing in Beloit. Gardner officers are: M. A. Hollengreen, president; Walter B. Leishman, vice president and general manager; C. Winslow Thompson, vice president and assistant general manager; and M. F. Frantz, treasurer.

Stover Lock Nut & Machinery Corp., Easton, Pa., has purchased a new, larger plant at Hilton & Holly Streets, Easton, Pa. All operations are now being conducted at the new plant.

Ohio Electric Mfg. Co., Cleveland, has purchased all assets, except the plant, of Wright Hoist Div., Lisbon Hoist & Crane Co., Lisbon, Ohio, and has also purchased the nail-making machine business of Black Industries, Inc., Cleveland. The "Bob-Cat" hoist of Wright Hoist will hereafter be manufactured in the Ohio Electric plant with full production now scheduled for April.

OBITUARIES

A. F. Strafer, 73, associated until 1940 with Failor Strafer Machinery Co., New York, died March 12. His first identification with the machine tool industry was with Lodge & Shipley Co., Cincinnati. He was associated with R. K. LeBlond Machine Tool Co., and president of National Machine Tool Co. During the first world war he was with Motch & Merryweather Machinery Co., Cleveland, and then with Kemp Machinery Co., Baltimore, and Strafer Machinery Co., Baltimore and New York.

Frank A. Luebbe, 57, vice president and general sales manager, Nicholas Wire & Aluminum Co., Davenport, Iowa, died March 9.

David R. Lewis, 60, founder and president of Lewis Pattern Works, Dayton, died March 7. He started Lewis Pattern Works Co. in 1936.

Walter C. Wassman, 55, and his son, **Walter G. Wassman,** 26, were drowned when the boat in which they were riding capsized in rough waters of the Des Plaines river, March 19. The elder Mr. Wassman was manager, and his son was vice president, of the George L. Detterbeck Co., tool designers, Chicago.

Meetings

Apr. 2-4—American Management Assn., spring production conference; Hotel Statler, New York.

Apr. 5-7—American Institute of Electrical Engineers, conference on electric welding; Rackham Memorial Bldg., Detroit.

Apr. 10-12—American Society of Lubrication Engineers, annual convention; Hotel Statler, Detroit.

Apr. 10-14—American Society of Tool Engineers, industrial cost-cutting exposition; Philadelphia Convention Hall.

Apr. 12-14 — American Society of Mechanical Engineers, spring meeting; Hotel Statler, Washington, D. C.

Apr. 17-19—Society of Automotive Engineers, aeronautic meeting and aircraft engineering display, Hotel Statler, New York.

Apr. 24—Packaging Machinery Manufacturers Institute, semiannual meeting; Hotel Sherman, Chicago.

Apr. 24-27 — American Management Association, national packaging exposition; Navy Pier, Chicago.

Apr. 25-26—Metal Powder Association, annual metal powder show; Book-Cadillac Hotel, Detroit.

Apr. 25-26 — Machine Tool Electrification Forum, sponsored by Westinghouse Electric Corp.; Hotel Statler, Buffalo.

May 7-9—Conveyor Equipment Manufacturers Assn., meeting; The Homestead, Hot Springs, Va.

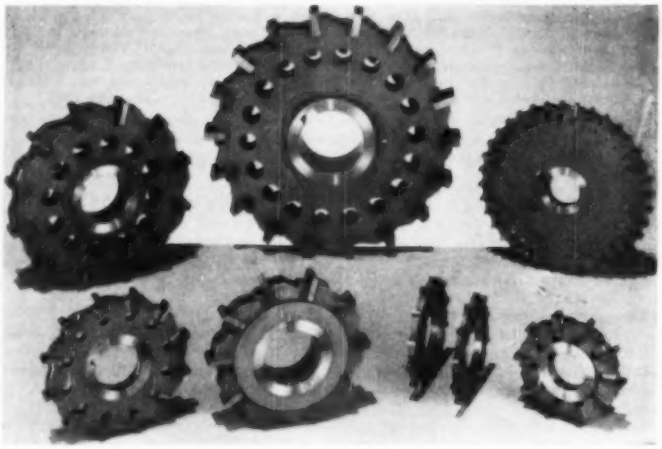
May 8-12—Natl Assn. of Textile Machinery Manufacturers, exhibition; Auditorium, Atlantic City, N. J.

May 24-25—American Iron & Steel Institute, general meeting; Waldorf-Astoria, New York.

May 25-27—Society for Experimental Stress Analysis, spring meeting; Hotel Statler, Cleveland.

SHOW IN PRINT

New products, shown in this section, have not been described previously in American Machinist . . . They will be exhibited at the ASTE Industrial Cost-Cutting Exposition, Convention Hall, Philadelphia, April 10 to 14 . . . A complete list of exhibitors and their booth numbers will be found on pages 145 to 147.



More Blades, Easier Sharpening Designed Into Lovejoy Cutters

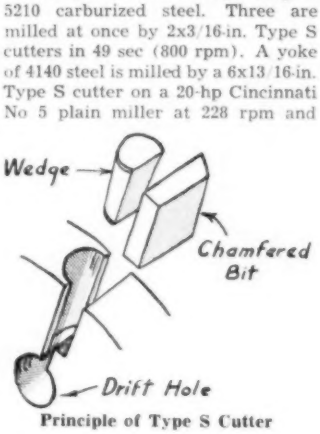
Carbide blanks of standard shapes, held in slots in the cutter body by tapered circular-peg wedges, characterize the new Type S cutter. This design permits a greater number of blades per cutter and a larger arbor hole for a given cutter diameter, as well as adjustment for minimum carbide grinding. As the blades have considerable peripheral overhang and side clearance, only a diamond wheel is necessary for resharpening.

Developed by G. T. Attridge, engineer at Lovejoy, this cutter design was considered impractical by the company's own shop men until tested. The top quarter or third of the carbide bit is unsupported, and the wedge bears at approximately the center of the bit. Original plans were for slotting cutters only, but side milling, straddle milling, and other operations can be done without difficulty. The principle has also been used in a 3-blade boring tool which operates at 300 rpm and 0.022-in. feed per revolution in boring Hastelloy nuts, removing 30 cu in. of metal in 40 sec.

Cutter bodies can be extremely thin, and are stocked in widths of 3/16, 1/4, 5/16, 3/8, 1/2, 5/8, 3/4, and 1 in. The 3x3/16-in. cutter has 1-in. arbor hole and 12 blades, tips (No. 1040) costing 11 cents each. The largest standard is an 8x1-in. cutter which uses 18 blades, tips (No. 1410) costing $1.70 each. Bodies are heat-treated chrome-nickel steel and available in diameters from 3 to 8 in., the 3-in. size having 8, 10, or 12 blades and the 8-in. size 18, 28, or 32 blades. Blade sizes and shapes vary with cutter size and type, but are standard bits, and all carbide grades can be used interchangeably in the same cutter body. Further, in common sizes, special bits with preformed chamfer are available to reduce initial grinding. Chip-breaker or form shapes may be ground in the bits as desired.

When a cutter is assembled, bits may be set staggered for a wide cut. Lovejoy has a special setting fixture for this purpose. Inserts are located and wedges are inserted and driven tap tight with pin and plastic hammer; then the cutter is removed to a wooden arbor and support block for final tightening of the wedges in turn. Bits may be removed by drifting through the holes provided.

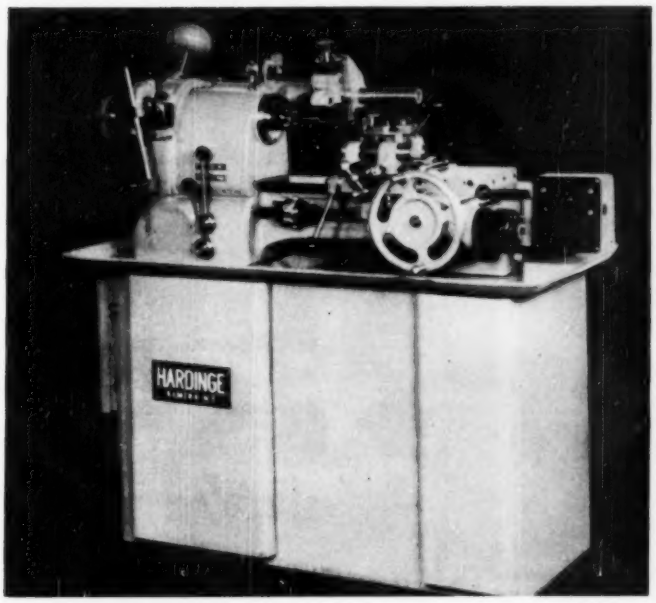
These cutters have been available for approximately a year, but have not previously been announced. In that period, some 93 companies have applied them. One application is on an automotive transmission part in which an annular internal slot 3/16 in. wide, 1/4 in. deep, and roughly 4 in. in dia is milled. The ring is 5210 carburized steel. Three are milled at once by 2x3/16-in. Type S cutters in 49 sec (800 rpm). A yoke of 4140 steel is milled by a 6x13/16-in. Type S cutter on a 20-hp Cincinnati No 5 plain miller at 228 rpm and



Principle of Type S Cutter

9¼-ipm feed. A 12-in. flywheel on the outer end of the arbor smoothes out cutting and assists in maintaining 202 pieces per grind. In 1141 steel, a 5x33/64-in. cutter cuts a yoke slot at 309 rpm and 12-ipm feed. With tips pushed out to form a stagger-tooth cutter 0.646 wide, the slot is milled at 7½-ipm feed. In such cases, feed is set to not less than 0.005 in. per tooth, and frequently reaches 0.008 to 0.010 ipt. On one side-milling job, a 4x¼-in. cutter with 16 blades ¾ in. deep cuts 3140 steel at 322 rpm with 20-ipm feed, meaning 0.004-in. per tooth chip load and 340 sfpm.

Lovejoy Tool Company, Inc., Springfield, Vt. **Booth 846**



Large-Diameter Chucking Machine Eliminates Additional Setups

Developed to fill the gap between their second-operation machine and the large turret lathes, the Hardinge chucking machine turns, bores, or threads to completion, such parts as turret-lathe or screw-machine blanks, stampings, castings, forgings, and work that ordinarily requires additional setups and machines. Parts up to 6-in.dia can be handled with accuracy said to have previously been associated with smaller-dia work.

Work requiring many bored and turned dia that must be relatively concentric, as well as having a fine finish, can be produced on a rapid-production basis on the machine. The eight-position turret and production threading head use standard tools, making simple setups permissible for low-cost tooling and low setup costs for short runs. The precision threading unit, which is separate, is said to be equivalent to the addition of another position on the turret for other tooling.

Each turret station can be adjusted for final position of the cutting tool, without affecting the other turret stations. The turret takes standard ⅜-in. square toolbits, or ⅜- x ¾-in. rectangular tools, directly on the hardened-and-ground steel-top surface. Through use of single, double, and triple toolholders, as high as 24 single-point tool operations can be performed in one setup. The carriage has a built-in cross-feeding turret which permits work to be bored, turned, and faced from the turret with extremely short length tooling.

Headstock spindle has a speed range of 150 to 3000 rpm, forward or reverse. It takes standard 5C collets, providing a 1-in. round collet capacity through the spindle. Step chucks provide collet-like chucking of work up to 6-in. dia. The production threading head is controlled by

. . . on succeeding pages

Boring spindle, spotting tool, and microscope on precision jig borer can be brought successively to the same spot by a single turn of a handwheel .....page 184

Wet-honing machine has self-energizing brake which stops spindle instantly, speeding loading. page 185

Universal precision grinder with tapered table foils the shop "junk piler".....page 186

Twin-mill unit for small-parts milling, machines two or more surfaces simultaneously; requires only one fixture.....page 192

Sound tester checks external, internal gear units. Overly noisy gears are detected and corrected before assembly .....page 196

Automatic gear hobber machines small gears and pinions for precision parts .....page 200

Electronic counter facilitates presetting length of runs on operations to any number from 1 to 999 by pushbutton.....page 204

DESCRIPTIONS OF shop equipment, materials, and parts, regularly shown on these pages, will be found starting on page 254.

...and in April 17

Lathe produces all types of toolroom and general turning work at high speed. The unit has independent variable electric feed for carriage and cross-slide.

Horizontal indexing unit allows wide range of tooling applications for drilling, reaming, countersinking, and tapping operations. Cycle is automatic.

Cutter and tool grinding machine with universal equipment is for rapid accurate sharpening of a wide variety of tools.

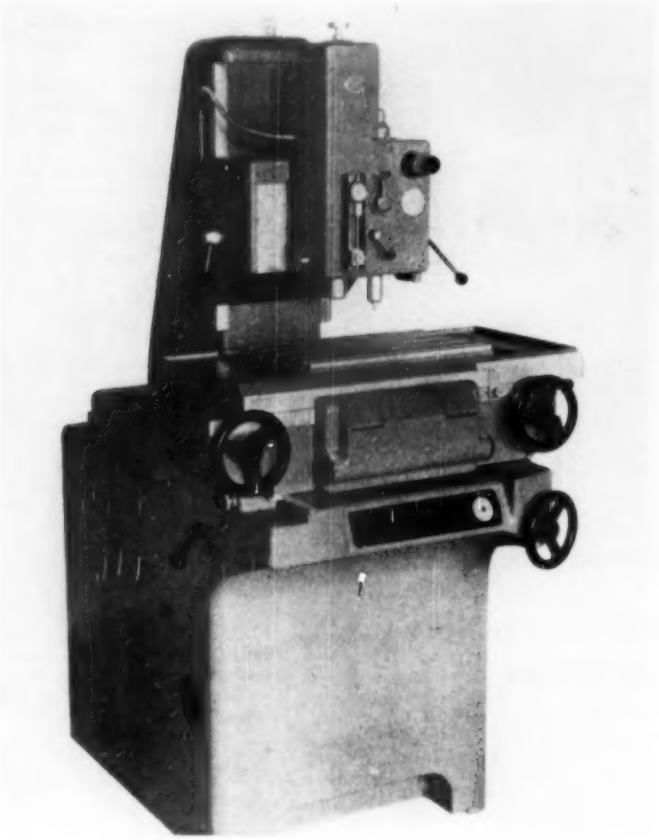
a precision master leadscrew, mounted on the rear of the headstock spindle. There are no intervening gears, thus assuring accurate duplication of the leadscrew. With a carbide-tipped single-point tool, it is often possible to thread at the same surface speed as that used for all other cuttting tools in a setup.

Step-chuck capacity is 6 in., jaw-chuck capacity, 5 in., swing over bed, 13 in., and max distance from face of turret to spindle is 12 in. Travel of cross-slide with screw feed is 4 in. and travel of cross-slide with lever feed is 1½ in. Power feed range of the machine is ⅛ to 4½ in. per. min.

Hardinge Brothers, Inc., Elmira, N. Y. **Booth 835**

Working range is 8x8 in. and table working surface is 15¾x9¾ in. Electronically controlled stepless spindle speeds range from 200 to 3000 rpm and spindle quill travel is 2⅛. Max free distance under the spindle head is 11¾ in., drilling capacity is ¼ in. and boring capacity is ⅝-in. dia.

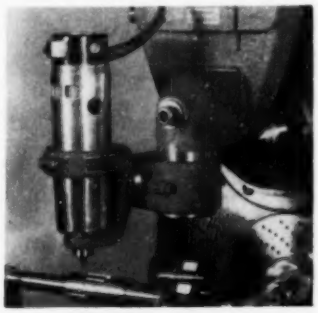
American Sip, Div. of Societe Genevoise D'instruments de Physique, 100 E. 42 St., New York, N. Y. **Booth 502**



Precision Jig Borer Provides Projected Optical Settings

Boring spindle, spotting tool, and microscope of the MP-1H, high precision jig borer can be brought successively on the same spot of the work by a single turn of a handwheel, without any dismantling. The boring head occupies two positions, determined by abutments. The first is for the boring tool and the second, for the microscope or spotting tool. When the latter is used, the lower part of the microscope is automatically withdrawn, but reverts to its position as soon as the spotting tool is raised again.

Optical setting of both the worktable and the circular dividing table are magnified and projected onto opaque and dull screens. Manufacturers say readings can be obtained to one sec of the arc and the unit is guaranteed to 3 sec on the dividing table and 0.00004-in. on the worktable.



High-Speed Grinder-Miller Attachment Is Motorized Quill

A range of speeds from 20,000 to 45,000 rpm can be obtained with the Precise grinder-millers. Manufacturers describe these units as motorized quills or machine elements, capable of doing very close work at high speeds. They can be mounted on standard lathes, milling machines, and drillpresses, among other stationary machine tools. Applications include internal, external, cylindrical, and form grinding, precision milling with HS steel or tungsten-carbide mills, sawing, routing, slotting, small-dia drilling and finishing, and micro finishing and polishing. Power is by ¼-hp motor.

Precise Products Co., 1328-30 Clark St., Racine Wis. **Booth 441**

Safety Drill Vise Embodies Adjustable Column Attachment

The column attachment of this vise insures against accidents resulting from the vise or work turning during drilling. The attachment comes in two adjustable sizes, fitting column diameters from 1⅝ to 4 in. It enables the entire unit to be swung out of the way of the table when not needed. A rod that runs into the

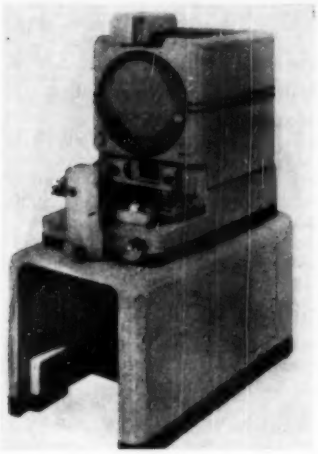
vise from the column attachment allows adjustment in and out as well as radially around the column. A turn of the handle locks or unlocks the vise which can be instantly placed in position for any size work up to 6-in. width. Maximum jaw opening is 6 in., jaw height 1½ in., jaw width 4 in., and vise height 3 in. The entire unit weighs 25 lb.

Universal Vise & Tool Co., Parma, Mich. **Booth 1152**

Screw-Thread Analyzer Checks "Assemble-ability"

The Johnson screw-thread analyzer is composed of a roll-snap comparator and a ring-snap comparator. The combination provides readings on pitch diameter (separately), and of all of the thread elements effecting the fastening qualities, collectively. The differential between the pitch diameter reading and the cumulative reading is said to be the total amount of combined error in lead, incorrect helix, out-of-round, angle, and other thread elements and conditions effecting "assemble-ability."

Johnson Gage Co., 534 Cottage Grove Road, Bloomfield, Conn. **Booth 1051**



Contour Projector Offers Greater Working Space

The kodak contour projector, Model 2, is an optical comparator providing 14¾ in. of work space between lamphouse and lens, regardless of magnification. The worktable is 20 in. in length and vertical travel is 4 in. Eight in. are provided between the object under inspection and the first lens of the projection system. The lamphouse can be swung down to permit surface inspection of long objects which extend out in front of the instrument. A mirror attachment, providing surface or blind-hole illumination in any of five planes, facilitates surface projection. A ball-bearing-mounted six-station lens turret permits instant selection of any of six magnifications by turn of a handwheel. Lenses available for the turret are made in 10x, 20x, 31.25x, 50x, 62.5x, and 100x magnifications.

Eastman Kodak Co., Rochester 4, N. Y. **Booth 816**

Diamond Abrasive Compound Maintains Stability to 150 F

Dymo abrasive compound for finishing of molds and dies of steel and carbide is composed of crushed, graded, and cleaned pure virgin diamond, held in a vehicle, said to provide stability up to 150 F. The vehicle is further said to impart greater cohesion to minimize slinging, and to create uniform suspension of abrasive particles. The compound is also reported to provide faster cutting.

Industrial Products Div., Elgin National Watch Co., Aurora, Ill. **Booth 306**

Sunnen Wet-Honing Machine Employs Self-Energizing Brake

The machine spindle of the Model MBB wet-honing machine is mounted on precision ball bearings, preloaded, and sealed with life-time lubrication. Spindle chuck is made of heat-treated tool steel, and is provided with centering adjustments to eliminate "runout" of the honing mandrel and work. The machine has 4 speeds, uses standard Sunnen honing mandrels for sizing and finishing from 0.12- to 2.625-in.-dia holes, and is recommended for all metals, ceramics, and glass.

A self-energizing brake stops the spindle instantly, speeding loading and unloading of work. A lockout screw is provided for cutting the pressure mechanism when automatic stone feed-up is not desired. The unit is for production, tool and die work, salvage operations, and maintenance. Any accuracy can be obtained from simple deburring work to ultra-precision fuel-injector fitting. Power is by ½-hp capacitor motor.

Sunnen Products Co. St., Louis 17, Mo. **Booth 531**

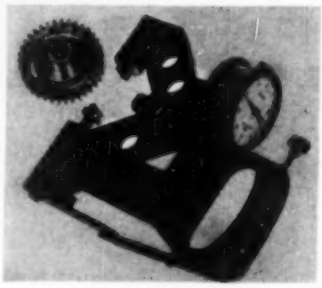
Tapered Table Cuts Junk Piling On Universal Precision Grinder

Design changes in the Nife Universal precision grinder both increase the worktable size and foil the shop "junk piler". Experience with the earlier US-21 model has indicated that flat table wings soon become catch-alls in the shop. Tapered table ends on the larger model US-305 eliminate this temptation.

Electrical switch for the rotary grinding attachment has been incorporated in the switch panel at the front of the machine, eliminating plugging from the rear. A portable blower is also built into the mount of this machine. Vertical alignment of the spindle center and center of the grinding wheel is automatically shown on an index indicator.

Worktable clamping surface is 4½x24¾ in. and distance between centers is 12½ in. Special tailstock can be obtained, providing 24⅝ in. between centers. Max grinding dia between centers is 8⅞ in. and the dividing head is provided with No. 5 Morse taper cone.

Nife Inc., 165 Broadway, New York 6, N. Y. **Booth 12**



Dial Snap Gage Adapted As External Spline Gage

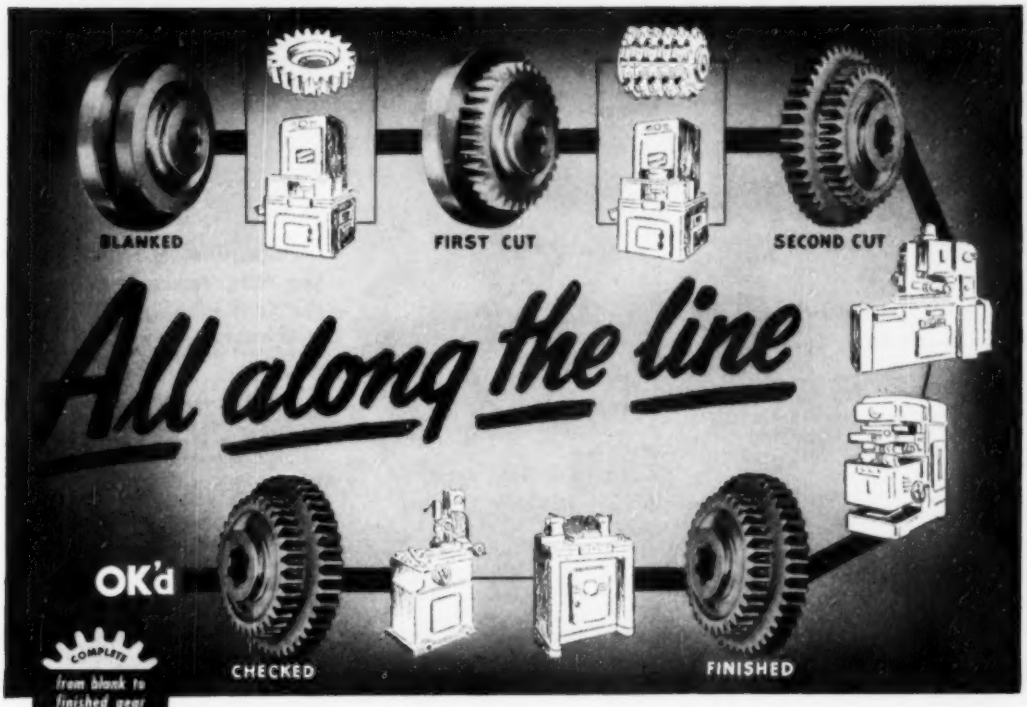
The Nilco external spline gage has been designed around the standard Nilco dial snap gage by using the hardened rolls on the upper and lower anvils and a lifting lever which will depress the lower anvil to clear the OD of the spline or gear. This gage will check the pitch diameter of gears with odd or even numbers of teeth. The lower anvil rotates slightly so that the two rolls can align themselves with the gear teeth being checked.

Nilsson Gage Co., Inc., 2A Lake St., Poughkeepsie, N. Y. **Booth 1151**

Slot-Grinding Attachment Built Into Moore Jig Grinder

Angular and indexing devices built into the main spindle of the No. 2 jig grinder and a slot grinding attachment permit accurate grinding on any contour. The increased spindle power and infinite feeds up to down make chop grinding of contours possible. This method in which the wheel contacts only a small part of the work is said to remove stock very rapidly, thus cutting grinding time, and also facilitating form grinding of die sections. Grinding speeds range from 12,000 to 16,000 rpm. Table size is 10 x 19 in., table movement 10½ x 16½ in., table top to wheel collet 0 to 16 in., spindle to column ways 10 in. and grinding capacity with grinding wheels 3/16 to 5 in., and with diamond mandrels 1/64 to 3/16. Main spindle slide travel is 3⅝ in. and angular adjustment of spindle, up to 1½° either way. Radial offset of grinding spindle is to 1⅛ in. off center by rough adjustment, and while running, 0.0001-in. adjustment for a distance of 0.1 in. in 1⅛-in. range.

Moore Special Tool Co., Inc., Bridgeport 7, Conn. **Booth 1007**



COMPLETE from blank to finished gear EQUIPMENT

We're in the business of cutting gear costs—ALL ALONG THE LINE
. . . with machines, with tools
. . . and WITH SOMETHING ELSE.

Sure we make all types of hobs, shaper cutters and miscellaneous gear tools; gear finishing machines (10 different models) for every kind and size of spur and helical internal and external gear. Sure we developed pre-shave hobs and cutters, Sine-Line gear and hob checkers (13 machines) plus Shear-Speed machines (4 sizes) to cut gears as fast as they can be finished.

But that's only part of the story. Tools and machines are like ingredients in a good stew. Each must be good, but you must also mix them correctly.

When you do:

. . . you can frequently HOB AND SHAVE a gear in LESS TIME than it takes just to hob it. You can also wind up with a lower TOTAL tool cost.

. . . you can cut total tool-change down-time with machines on which you change tools *more* often.

Crazy? Not on your involute.

. . . you can reduce cost of gear cutting by making a change in a *different* operation.

. . . you might get *more* output by *cutting* capital investment in new equipment by 80%.

. . . a different cutter width could easily cut shaving time in half.

Would you like to get your gear cutting tools "for nothing"?

. . . savings in re-grinding time can more than pay for the tools.

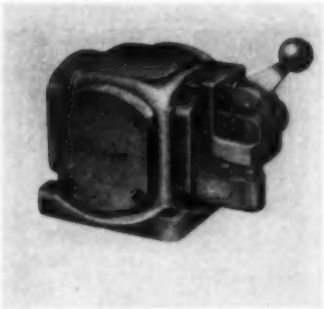
. . . raising your gear checking costs could cut over-all gear costs.

Impossible? They've all been done—many, time and again—by Michigan Tool engineers while cutting gear costs ALL ALONG THE LINE for somebody.

How much can we cut yours? Let's find out. Give us a ring or drop us a line.

COMPLETE from blank to finished gear EQUIPMENT

MICHIGAN TOOL COMPANY **7171 E. McNichols Road Detroit 12, U.S.A.**



Four-Way Diaphragm Hand Valve For Double-Acting Cylinders

This valve, designed principally for use with double-acting cylinders, is essentially two valves, one acting as a pilot. It is said to provide finger-touch control and is so constructed that piping to and from it can be concealed.

Two- and three-way pilot valves are also available with or without timers in ¾- and 1¼-in. NP thread sizes. Also added to the company's line is a cutout valve for systems where a fixed quantity of air is to be passed on each cycle. Air must be exhausted from the cylinders, tool, or work before a new cycle can be started.

A. Schrader's Son, Div. of Scovill Manufacturing Co., Inc., Brooklyn 17, N. Y. **Booth 752**

Non-Repeating Safety Mechanism Added to 5-Ton Press-Rite Press

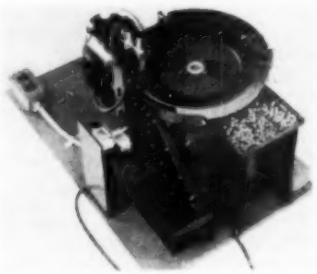
The Model "O" 5-ton Press-Rite press is available with anti-friction roller bearings in the flywheel, a cam actuated brake, a new type of connecting rod, and the Press-Rite non-repeating safety mechanism. Frame is of semi-steel unicast construction. The press weighs approximately 300 lb. without motor.

Sales Service Machine Tool Co., 2365 University Ave., St. Paul, Minn. **Booth 902**

Portable-Dial Hand Gage Has 2½-In. Throat Capacity

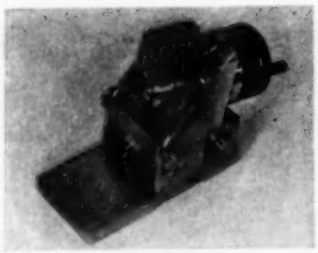
Gage No. 1015 is held in one hand by means of finger holes and operated by pressing a thumb lever which raises the spindle. Contact pressure of the ¼-in. dia flat anvils is independent of the operator. Gages are available in two thickness capacities: No. 1015-A, with indicator graduated in 0.0005 in. and ranges of 0 to ½ in., and No. 1015 B graduated in 0.001 in. with 0- to 1-in. range. Both have a throat capacity of 2½ in. Standard models are furnished with a double dial indicator, the small dial counting up to 10 rev of the large hand.

The L. S. Starrett Company, Athol, Mass. **Booth 322**



AUTOMATIC INSPECTION GAGE checks small iregular shaped disks for thickness. The disks are automatically fed onto the turntable which carries them under a Federal Electricator inspection unit. Parts are then deposited into one of three containers; one for right size, one for over size, and one for under size.

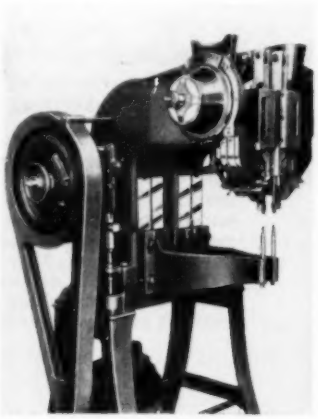
Federal Products Corp., 1144 Edyd St., Providence 1, R.I. **Booth 305**



Universal Grinding Fixture Has Sine Plate, Vernier Index Head

The Sta-Ga-Co master grinding attachment permits grinding of flats, cylindrical surfaces, tapers, slots, radii, and splines on a surface grinder. The unit incorporates a sine plate and a rotary index head with vernier. It is said to save time by elimination of set-ups for grinding of various surfaces. Completely hardened (Rockwell 62-64) the fixture is ground square to within 0.0002 in. on all surfaces. Vertical angles are said to be accurate to 0.0001 in. in 2.5 inches; rotary angles with index, within one minute; rotary angles with vernier, within 2 minutes; roundness (spindle), within 0.00005 in.; and spindle runout at nose, within 0.0002 in.

Star Gauge Co., 261 Oak Grove Ave., Springfield 9, Mass. **Booth 540**



Double Rivet Setter Has Adjustable Riveting Centers

Model 214 has a 14-in. stroke and will set 9/64-in. steel tubular rivets in lengths up to ⅝ in. The standard unit has riveting centers adjustable from ⅜ to 7 in. Special models are available with riveting centers from ⅜ to 15 in.

Chicago Rivet and Machine Co., Bellwood, Ill. **Booth 1123**

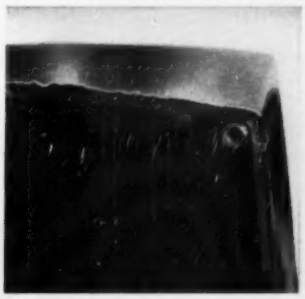
Abrasive Belts speed Philco TV Production

with abrasive cost measured in mils

American Insulator Corporation is molding Philco's latest TV cabinets in a one piece, twenty pound phenolic plastic mold. A twenty inch wide 3M abrasive belt is used to remove overflow flash and risers, and grind the entire surface to a plane in one operation.

This platen grinding operation illustrates one of the many materials and surfaces that can be quickly ground and finished by coated abrasive belts without the use of expensive equipment or fixtures. If your manufacturing process requires grinding or polishing ferrous or non-ferrous metals, wood, glass, or ceramics . . . it's a good bet that a plant survey by your nearby 3M Methods Engineer will uncover opportunities to make substantial savings over your present grinding or finishing methods. Write Dept. BW for FREE "case history" booklet.

BOX SEATS FOR YOUR ENTERTAINMENT with Philco's 10" screen table model 1104 . . . true luxury performance at a price that reflects skillful product design.



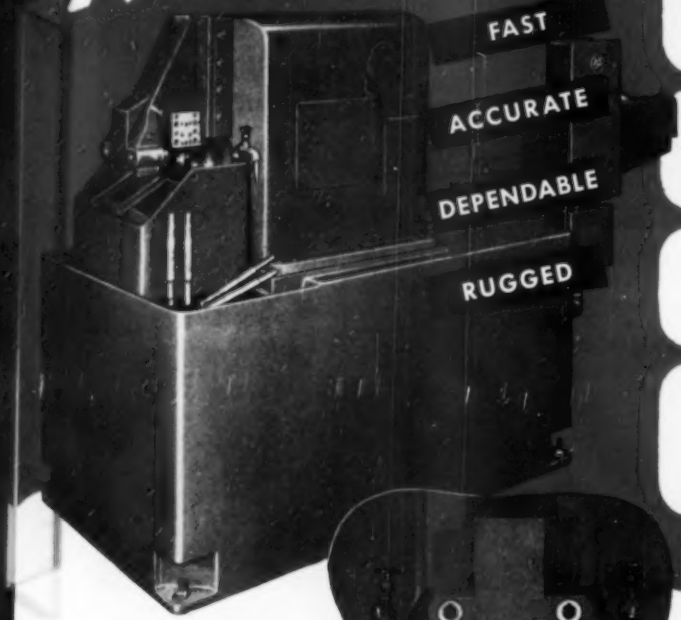
BEFORE—Plastic flash on cabinet back presents tough grinding problem.

AFTER—3M Belts bring surface to smooth plane in less than sixty seconds.

ONE-STEP MAINTENANCE. Removing flash, risers, and nibs from back of phenolic plastic TV cabinet, at American Insulator Corp., New Freedom, Pa.

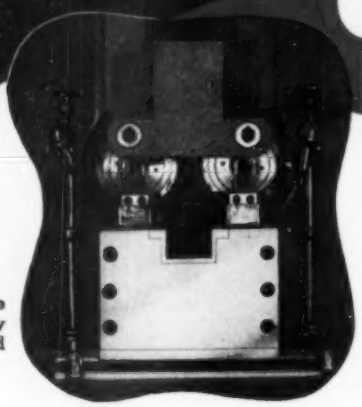
Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives. *General Export:* DUREX ABRASIVES CORP., *New Rochelle, N. Y. In Canada:* CANADIAN DUREX ABRASIVES LTD., *Brantford, Ont.*

The New Motch & Merryweather Automatic

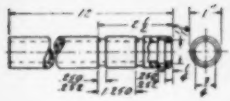


The new M. & M. Automatic is available as a bar-feed or hopper-loaded machine.

Illustrated at right are spindles and heavy duty forming slides with guard removed.



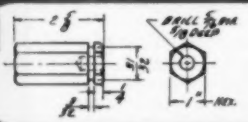
STUDY THESE TYPICAL JOBS



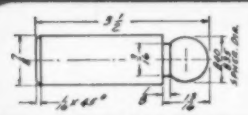
Operation: Form grooves, chamfer O. D., face and form internal groove.
Material: Seamless tubing—mild steel ⅛" wall.
Production: 1100 pcs/hr. @ 100% eff.

Operation: Form snap ring grooves, grease groove, chamfer and drill.
Material: AISI-1015.
Production: 720 pcs/hr. @ 100% eff.

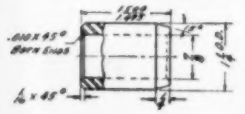
Operation: Face head, form back of head and neck.
Material: SAE 5120.
Production: 720 pcs/hr. @ 100% eff.



Operation: Form chamfer, groove, drill and cut off.
Material: Aluminum F.M.
Production: 680 pcs/hr. @ 100% eff.



Operation: Form diameter, groove, chamfer and cut off.
Material: Aluminum F.M.
Production: 510 pcs/hr. @ 100% eff.



Operation: Form chamfer both ends O. D. Break edges I. D. and cut off.
Material: Seamless tubing—SAE 1020.
Production: 600 pcs/hr. @ 100 eff.

The drawings above can only hint at the possibilities of the new, proven Motch & Merryweather Automatic. Study them closely, compare with your own requirements, and then

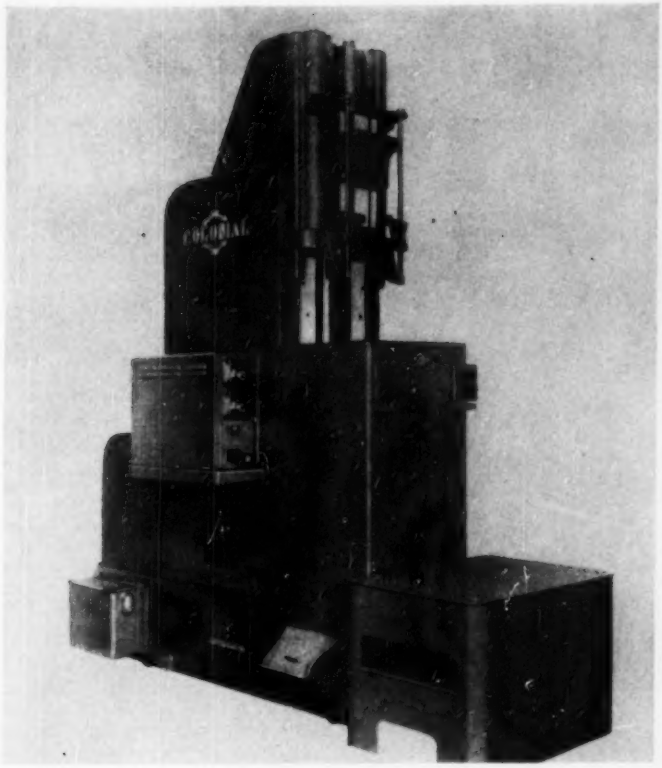
WRITE US FOR FULL INFORMATION, describing your needs.

Manufactured by

THE MOTCH & MERRYWEATHER MACHINERY COMPANY • 715 PENTON BUILDING, CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT



Broaching Machine Redesigned To Meet JIC Standards

Colonial single- and dual-ram surface broaching machines, and pull-up and pull-down internal broaching machines have been redesigned to conform to the new standards of the JIC. All electrical controls are group mounted in a single external dust-protected panel. All hydraulic controls are group mounted outside the machine on the panel on the opposite side of the machine column. Filters consist of individually replaceable cartridges, externally accessible. Hydraulic control valves are also replaceable without draining the system of the machine.

Colonial Broach Co., Box 37 Harper Station, Detroit 13, Mich. **Booth 1021**

Gage Blocks Available With Chromium-Plated Finish

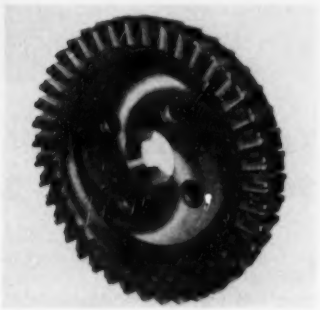
Johansson Gage Blocks have three fundamental uses; as master laboratory standards for control of measurement, as actual working instruments, and for periodic checking of inspection gages at the bench. The blocks come in three classes, *B* ±0.000008 in., *A*, ±0.000004 in., and *AA* ±0.000002 in. They can be obtained in working and inspection sets, chromium plated. Any block in any combination may be turned end for end without affecting the total size or parallelism of the two extreme surfaces. Run together, the blocks are reported to have cohesion equivalent to more than 30 times that of atmospheric pressure.

Brown & Sharp Mfg. Co., Providence 1, R.I. **Booth 849**

Milling-Vise Attachment Eliminates Chip Cleaning

Down-hold vise jaws and attachable parallels are said to eliminate the necessity of hammering work down or cleaning of chips between operations. The jaws can easily be attached to any type and size of machine tool and are equipped with adjustable stops. No feeler gages are necessary.

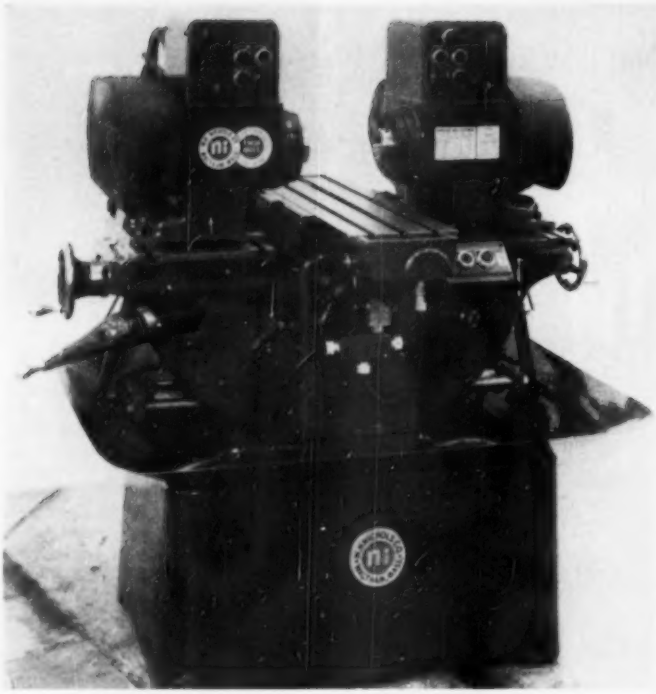
J & S Tool Co. Inc. Inc., 477 Main St., East Orange, N.J. **Booth 954**



Milling Cutters Have Solid-Carbide Inserts

The SerraTip line of cutters use solid carbide inserts and permit extremely fine tooth spacing, allowing inserted-blade construction in cutters as small as 1-in. dia. Cutters are built with three component parts—body, blade, and wedge. The blade consists of a solid piece of carbide across the back of which is brazed a wafer-thin piece of metal. The metal backing provides a serrated surface permitting quick positive positioning, controlled adjustability, and rigid anchorage of the inserts. SerraTip design can be used on a variety of cutters such as end mills, face mills, straddle mills, slotting cutters, reamers, boring tools, and various other combination tools.

Goddard & Goddard Company, P.O. Box 68, Brightmoor Station, Detroit 25, Michigan **Booth 1180**



Twin-Head Machine Mills Several Surfaces Simultaneously

The Nichols Twin Mill, for small-parts milling, machines two or more surfaces simultaneously, requiring only one fixture and one operator. It is primarily for automatic, light, high-speed milling, to extremely close limits, on all machinable materials. The miller is said to be speedily adapted from high-production applications to short-run work. The two independently geared milling units are mounted opposite each other on the knee and saddle assemblies. Machine table reciprocates automatically between milling heads.

Each milling head is V-belt driven by its own 1-hp pancake motor, providing a selection of 15 spindle speeds in geometric progression; lower speeds are secured through gearing and higher speeds through direct belt drive. The 10 geared speeds range from 55 to 590 rpm and the five belt-drive speeds, from 700 to 2050 rpm.

Milling-head saddles have micrometer-screw feed traverse adjustments, and the knees supporting the saddle and head assemblies have micrometer-screw feed vertical adjustment, controlled by hand crank. Thus either head may be independently adjusted up, down, in, or out to accommodate work variety. Tee-slots are provided for offsetting milling heads in the horizontal plane. Either or both heads may adapt a right-angle milling attachment in the spindle nose to convert from horizontal to vertical milling.

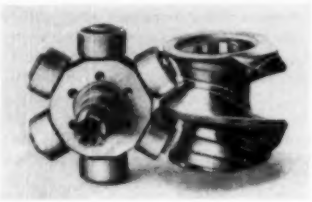
The machine table is arranged for automatic operation, powered by an air-hydraulic system providing rapid approach to cutting position, infinitely variable hydraulically controlled cutting feed, and rapid traverse to starting position. Provision can be made at the factory for automatic repetition of the table feed cycle and automatic indexing of the work. Cutting speed is infinitely variable, controlled and stabilized by a hydraulic cylinder with check valve. Automatic table drive is pneumatic, solenoid controlled, with trip and limit switches to govern table movement.

Nichols-Morris Corp., distributor for W. H. Nichols & Sons, Waltham, Massachusetts. **Booth 931**

Dynamic Balancer Checks High-Speed Rotating Parts

The Annis dynamic balancing machine is for precision balancing of high-speed rotating parts weighing up to 20 lb. It employs a photoelectric scanning arrangement to determine the phase of unbalance. Independent readings are obtained for each end of the rotor and both phase and amplitude of unbalance are plotted simultaneously on the screen of a cathode-ray tube permitting rapid operation. A recording-meter attachment makes permanent, graphic record of the balance condition of rotors as received, time required to make balancing corrections, and quality of the balance as completed. The record chart also shows production speeds as well as downtime.

R. B. Annis Company, Indianapolis, Ind. **Booth 1056**

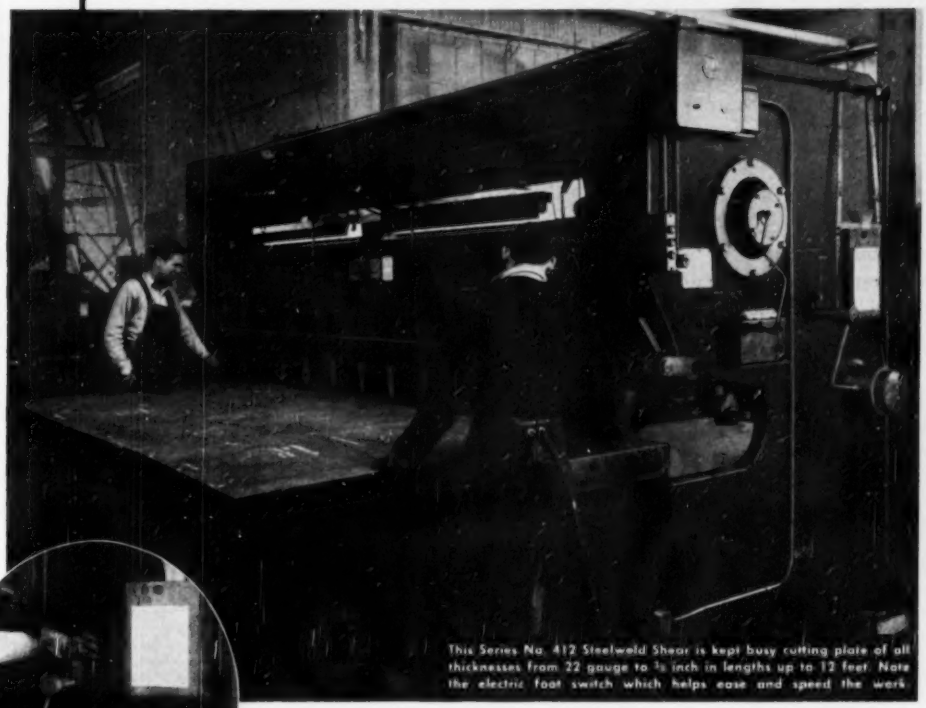


Intermittent-Motion Mechanism Gives Precise Position Locking

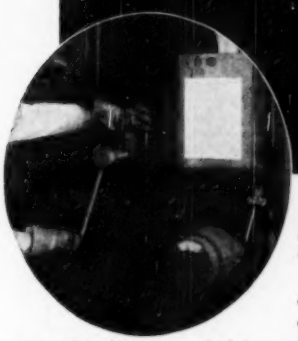
Precision high-speed intermittent-motion drive is uni-directional in operation, and provides precise position locking during rest, eliminating additional locking and locating devices. Controlled acceleration, generated into the cams, provides shockless motion in working period. Drive is applicable to punch-press dials and high-speed automatic machinery.

Ferguson Machine & Tool Co., Inc., 471 Paul Ave., Ferguson Station, St. Louis 21, Mo. **Booth 851**

KNIVES STAY SHARP LONGER for California Steelweld Shear User



This Series No. 412 Steelweld Shear is kept busy cutting plate of all thicknesses from 22 gauge to ½ inch in lengths up to 12 feet. Note the electric foot switch which helps ease and speed the work.



One of the big reasons why knives stay sharp longer on Steelweld Shears is the simplicity with which knife clearance can be adjusted for every plate thickness. It's merely a matter of turning a hand crank until the gauge pointer is on the proper figure. No bolts to loosen. No need of a feeler gauge.

"It's a shame," said the shop foreman at Stephens-Adamson Mfg. Co., Los Angeles, California, "but since installing our Steelweld Shear the knife-sharpening man has been crying because we have no work for him."

After months of continuous operation, eight hours a day, usually six days a week, inspection of cut pieces indicates the knives are practically as sharp as new. Parts cut have no burrs and are straight and true. Even when the cutting edges of the knives finally become dulled, there are three more cutting edges ready for use as all four corners of each knife are prepared for shearing.

Stephens-Adamson like their Steelweld Shear and are happy over its operation. It plays an important role in the manufacture of screens, elevators and conveyors which are the principal products of this large West-coast plant. In their words, it is "heavy, well built and dependable. We know it is reliable and always ready to handle our work from day to day."

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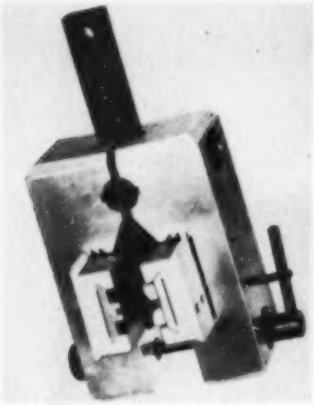
CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1417 EAST 282ND STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS



Honing Tools Size and Finish External Diameters

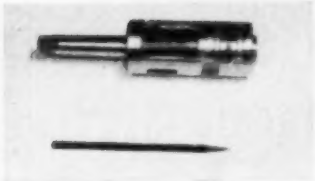
Honing-tool line covering a dia range of ⅛ to 2¾ in. can be used with all metals, all hardnesses fo rsizing and finishing external diameters. These precision external hones are said to replace lapping in most instances because of faster set-up, cleaner operation, and uniform cutting rate of the bonded abrasive honing stones. Correction of "cloverleaf" patterns and avoidance of "washout," caused around ports and lands during operations on such items as fuel injection plungers, hydraulic pistons and barrels, are reported. Dimensional accuracy can be obtained to within 0.001 in. Micrometer feed-up, fingertip control, and a steel arm to absorb honing torque, are built into this tool.

New Products Dept. 1, Sunnen Products Co., 7910 Manchester, St. Louis 17, Mo. **Booth 531**

Thermo-Guard Blocks Insulated From Body Heat

High wear resistance of the carblox thermo-guard is said to insure years of precision and to largely eliminate need of periodic checkups to detect undue wear. Thermo-guards are inlaid in all 2-, 3-, and 4-in. carbide blocks, completely insulating them from the heat of the hand.

Webber Gage Co., 12900 Triskett Road, Cleveland 11, Ohio. **Booth 708**



Floating Toolholder Corrects Misalignment Between Tool, Work

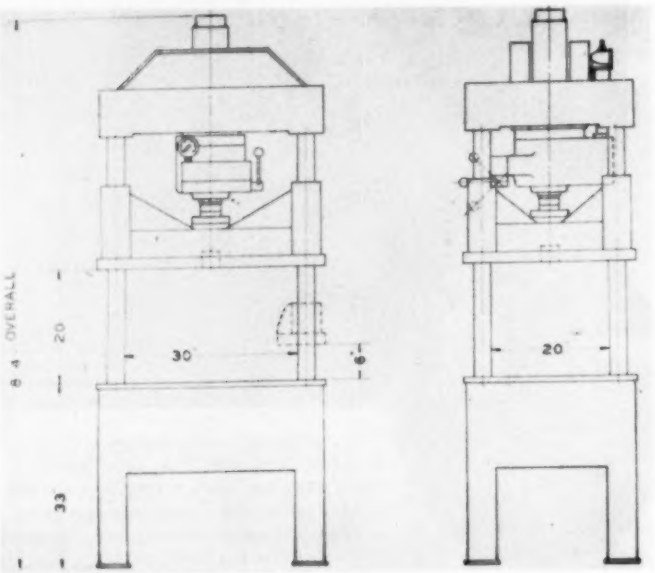
A double gear or spline drive coupling in the JA floating holder gives unrestricted parallel and angular float for accurate stopping, reaming, and similar operations. Misalignment between tool and work is said to be instantly corrected. Large lubricated surface areas are to cushion torsional shock and overload. The floating holder is available in three sizes with Morris taper shanks and collets.

Scully-Jones and Co., 1902 South Rockwell St., Chicago 8. **Booth 843**

Diamond Lapping Compound Laboratory Graded

For finishing of molds, gages, tools, and most hard metal precision parts it is claimed that only two or three grit sizes of Star Dust pure-diamond lapping compound will take care of most requirements, giving a mirror finish. These sizes are: A-15, A-13, and A-11. Harder laps are used for removal of stock. A-10 may be used only if super-high finish is required.

Ace Abrasive Laboratories, Inc., 250 W. 57th St., New York 17, N. Y. **Booth 1148**



Hydraulic Die-Tryout Press Rated at 50-Ton Capacity

Model 50-DT, designed to meet needs of average tool and die shop for tryout dies and for sample or short-run production, provides power operation of the ram in both directions. In the rapid advance position the ram will operate at 45 in. per min, automatically changing to power advance when pressure reaches one ton. In power advance ram moves 3 in. per min, exerting 50 tons pressure. On return stroke the ram is capable of a 10-ton pull. The press is equipped with guided platens and has a 14-in. stroke. It can be operated wherever an air supply is available and is made with either of two style pumps: One provides rated tonange at 90 psi and the other, at 145 psi. If higher power advance speeds are required, a second air pump can be added. A special safety valve prevents overloading and the operating speed is completely variable. All controls operate from a single lever, simplifying press operation.

Dake Engine Co., Grand Haven, Mich. **Booth 1014**

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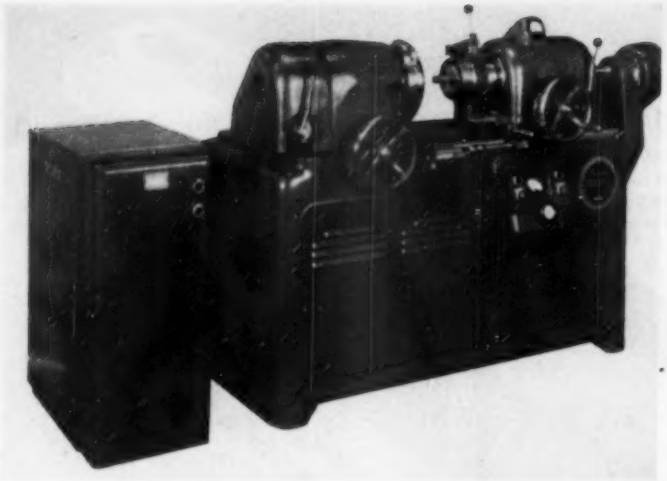
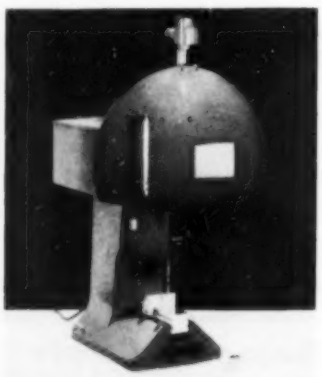


Sound-Testing Unit Handles External and Internal Gears

Both external and internal gears, and especially planetary gear assemblies such as are used in automatic transmissions, can be sound-tested on this machine. Gear sets which are objectionably noisy in operation are detected and can be corrected before reaching assembly. The machine is built in two sizes; one for gears up to 14-in. dia and the other for gears up to 24-in. dia. Tests are run in four different speeds in either direction with or without gear loading. The machine can be equipped for air clamping to expedite loading or unloading.

National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13. **Booth 601**



Production Thickness Gage Provides Extreme Accuracy

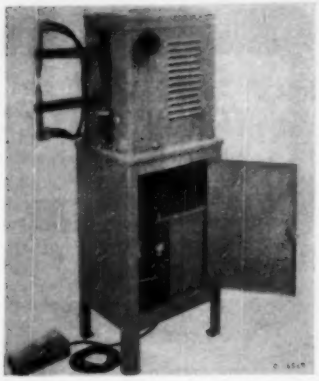
Capable of readings direct to 0.0001-in. this 3-in. thickness gage is designed for extremely accurate rapid control at production speeds. The measuring point is raised by a chain lift and lowered to the object by an escape mechanism to prevent thermal errors due to contact by operator's hands. Readings are taken from a glass viewing screen on which magnified images of the scales are shown. A vertical scale reads to hundredths and a horizontal interpolating scale reads directly to 0.0001 in. For highest accuracy it is recommended that 68 F operating temperature be maintained near the instrument.

The Bausch & Lomb Optical Co., Rochester, N. Y. **Booth 407**

Parts Hard-Chrome Plated to Size

Parts, hard-chrome plated to size, require no grinding after the plating operation. Tolerances on gages are held to within 0.0001 to 0.0002 and on production parts to within 0.0005. Plating is said to impart from 3 to 5 times the normal life of the part.

Chrome Electro-Forming Co., 7515 Lyndon Ave., Detroit 21. **Booth 955**



Automatic-Repeat Spotwelder Is Fully Controlled, Air Operated

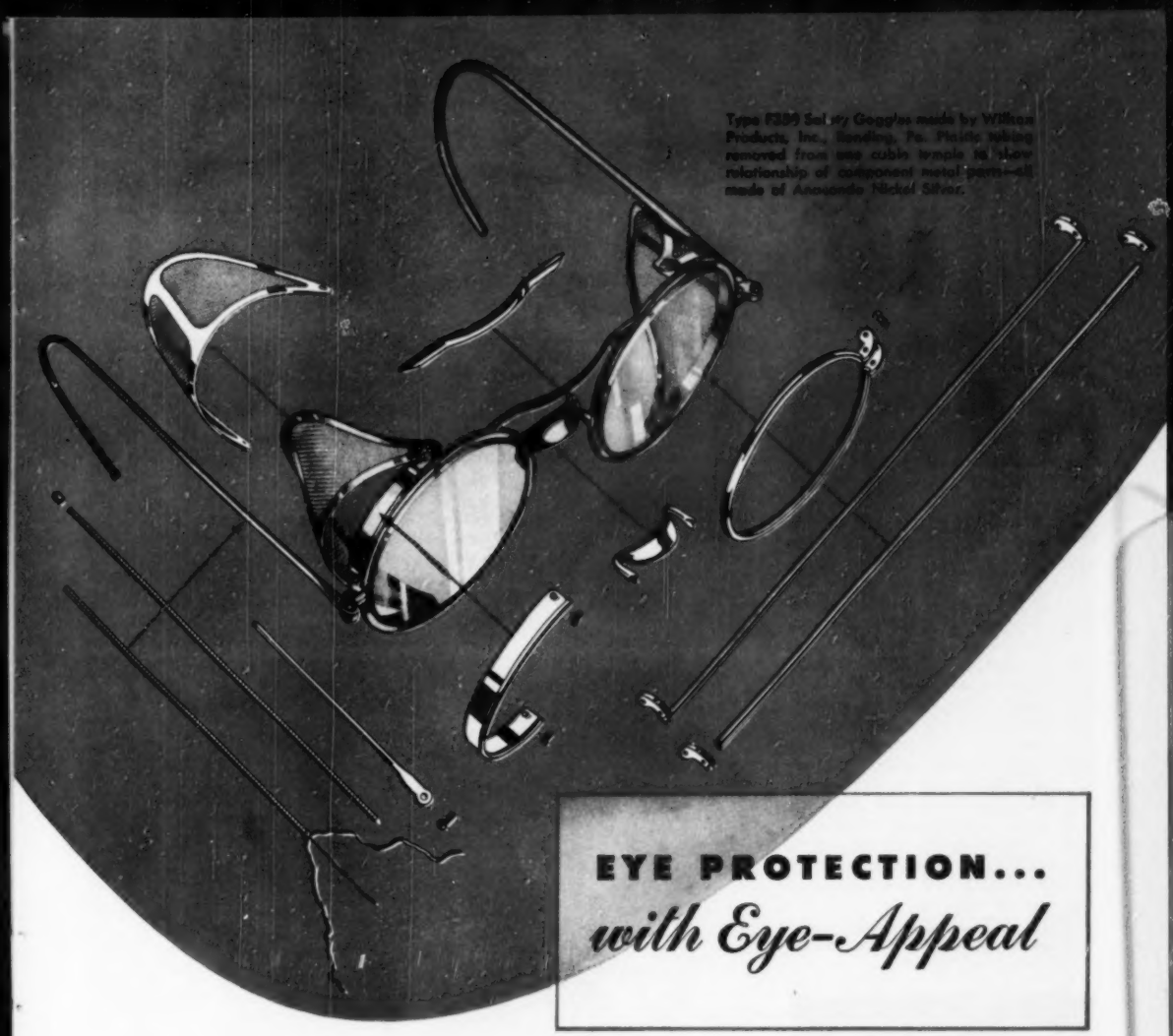
Air operated, fully controlled 5-kva spotwelder is equipped with a weld-current control, infinitely variable between maximum and minimum, an infinitely variable and readily accessible weld-pressure control, an electronic weld-time control with a range from 1 to 80 cycles, and a pneumatic dwell or off-time control. The unit is capable of high-speed production spotwelding on from two pieces of 0.002-in. steel shim stock up to two pieces of clean 14-gage mild steel. As many as 6000 welds can be made per hr on this machine. It has been rated in full compliance with RWMA standards and fully approved and listed by Underwriters' Laboratories, Inc. The complete unit is priced at $495.

Delta Mfg. Div., Rockwell Mfg. Company, 600 E. Vienna Ave., Milwaukee 1, Wis. **Booth 843**

Spherical-Rod End Bearing Available With Male or Female Threads

The Heim Unibal end bearing is designed for application on push-pull controls and linkages where it is necessary to correct for misalignment. They are available with male or female threads, right or left hand. Typical applications are on connecting rods of roll-feed mechanisms, speed-change linkages on high-speed polishing lathes, connecting arms on air cylinders, bell cranks, and Pitman arm drives.

The Heim Company, Fairfield, Connecticut. **Booth 599**



Type F389 Safety Goggles made by Willson Products, Inc., Reading, Pa. Plastic lenses removed from one cable temple to show relationship of component metal parts—all made of Anaconda Nickel Silver.

EYE PROTECTION... *with Eye-Appeal*

When a functionally efficient product possesses beauty—plus day in and day out serviceability—many of its merchandising problems are overcome.

The manufacturers of Willson Safety Goggles have found that Nickel Silver supplies this attractiveness and sturdiness in abundance. What's more, it provides an equally important third requirement—economy of fabrication . . . for Nickel Silver is one of the most workable metals available.

If the manufacture and sale of your product could be enhanced through this combination of clear-through beauty, ready workability and a longer service life—think in terms of Anaconda Nickel Silver. The American Brass Company can supply both the metal and the know-how, for each year it produces millions of pounds in all commercial forms, in all standard compositions, finishes and tempers. The address is Waterbury 20, Connecticut; in Canada, New Toronto, Ontario. 8088

ANACONDA *the name to remember*

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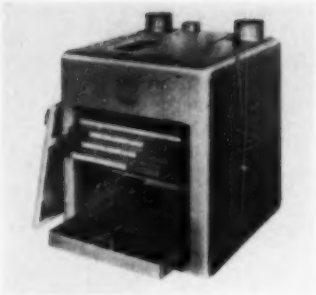
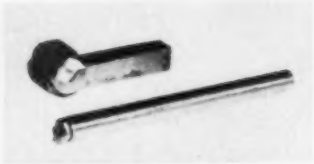


Dust Collectors for Use In Grinding, Dry Polishing Work

Hammond Dust Collectors are intended for general grinding and tool grinding as well as for polishing operations using dry abrasive wheels. Dust-laden air is drawn from the grinding-wheel head down through an air-expansion chamber to the bottom of the cabinet where heavier particles drop into the dust pan due to decreased air velocity and special air-fin construction. Air is next drawn up to a set of three fiber-glass filters which remove the finer particles. Filtered air is then exhausted to top vent into the room. The dust collector is available in three models; No. 50 (illustrated) is a 1000-cfm unit with two 5-in. inlets, run by a 1-hp motor; No. 40 has 700-cfm capacity with two 4-in. inlets, and is driven by ½-hp motor; and No. 30 is a 330-cfm unit with two 3-in. inlets, operated by ¼-hp motor.

Hammond Machinery Builders, Inc., Kalamazoo, Mich. **Booth 725**

HOB LEAD CHECKER (left) and recorder (right produce a graphic record showing exact location of each tooth on a hob in relation to all other teeth and in relation to desired theoretical lead helix. The chart is said to reveal the pattern as well as magnitude of any errors more clearly than tables of indicator readings formerly supplied with hobs. *Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill.* **Booth 756**



Circular Cutting Tools Can Be Reground Without Jig

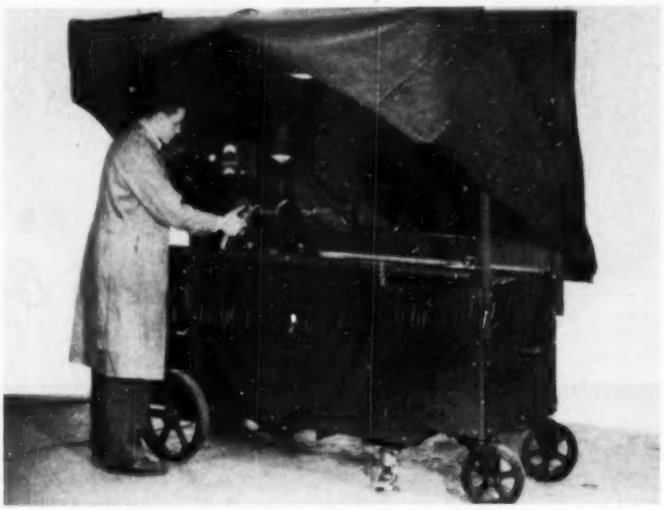
Koala circular cutting tools are used principally for external turning, facing, and forming, and internal boring, facing, and turning. Dull cutters can be replaced without removing the shank from the machine. The tools are so designed that the cutting edge of the new cutter will automatically be in the same position as that of the replaced part. Cutters can be reground without a jig, and any desired rake can be used. No serrations are needed.

J & S Tool Co., Inc., 477 Main St., East Orange, N.J. **Booth 945**

Titanium Thread Gage Shows Negligible Wear

The Titan ring thread gage is said to check male threads with gage wear reduced to a negligible amount. The ring is of the insert type with knurled aluminum collar, and the material in the ring is light-weight, but not fragile. It is also said to have inherent self-lubricating properties.

Republic Gage Company, Detroit 21, Michigan **Booth 947**

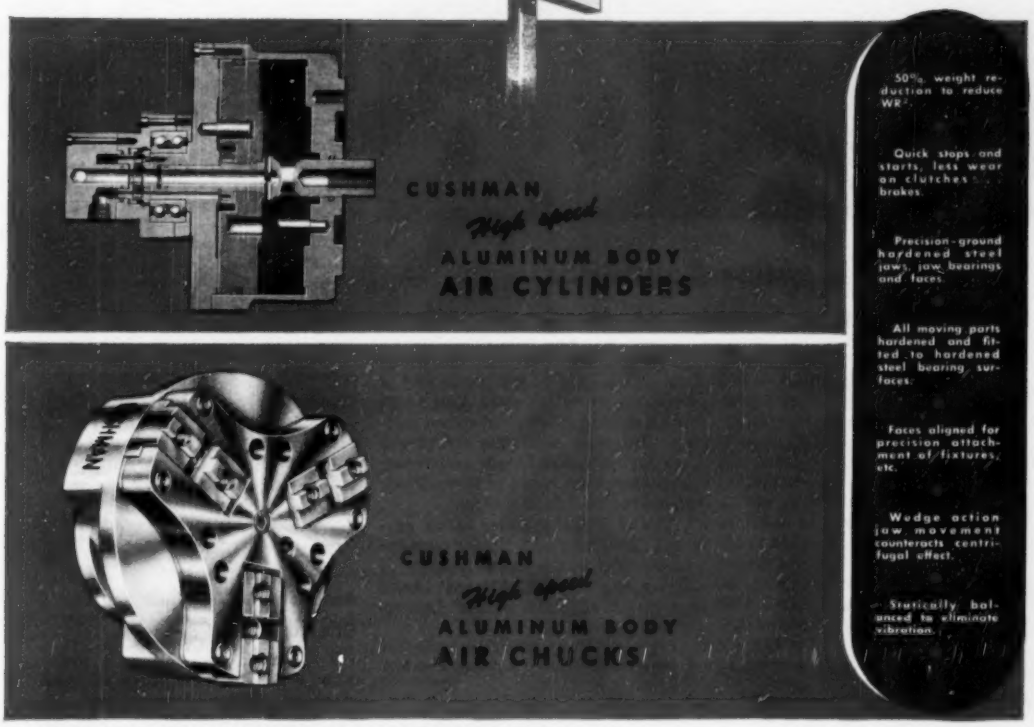


Inspection Unit Detects Defects at Point of Operation

The Magnaflux KDN unit is a small portable wet-type inspector which uses Magnaglo and is for process control in forge plants, foundries, tool shops, or manufacturing plants. It is completely self-contained and can be plugged into any 220-v line for operation and inpection of parts up to 54 in. long. The KDN has a towhitch for attachment to plant trucks for towing to any local point where trouble is occurring due to cracking of parts within a plant. It is put into operation directly at the point where the faulty parts are being processed. It gives positive segregation of crack parts, and is said to allow optimum and flexible process control so that cracked parts are not made in high volume avoiding expensive final inspection scrapping of fully machined parts.

Magnaflux Corporation, 5900 Northwest Highway, Chicago 31 **Booth 563**

RAISE your speed limits and LOWER your costs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AIR CYLINDERS
50% weight reduction to reduce WR².
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Faces aligned for precision attachment of fixtures, etc.
Wedge action jaw movement counteracts centrifugal effect.
Statically balanced to eliminate vibration.
CUSHMAN
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ALUMINUM BODY
AIR CHUCKS

MATCHED TO PERFORM CONSISTENTLY

AT SPINDLE SPEEDS UP TO 6000 r. p. m.

This, we believe, is the first time that a matched, balanced and standardized combination of aluminum body rotating air cylinders and air chucks has been made available for safe day-in, day-out operation at such speeds.

Engineers will at once recognize the problems that had to be solved . . . the tremendously increased influence of centrifugal forces and the necessity for reducing weight and flywheel effect while at the same time maintaining rigidity, jaw grip, and accuracy of centering. Cushman has solved these problems and the Chucks and air cylinders are now available to meet a wide range of tooling applications. Possible cost savings with this type of equipment on new high speed machine tools are substantial enough to warrant your immediate investigation. Write us outlining your operation.

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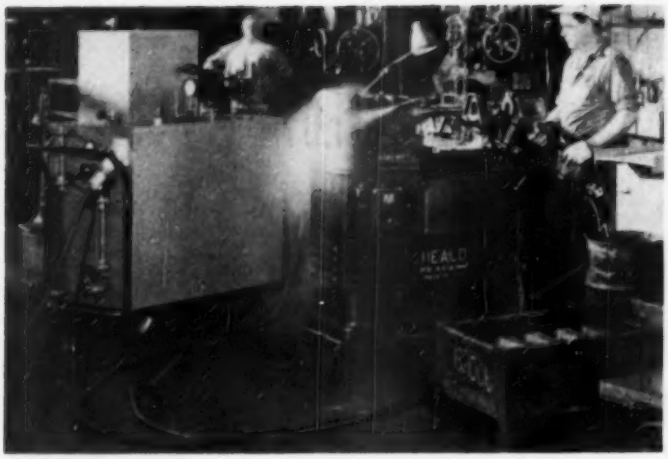
THE CUSHMAN CHUCK CO.
HARTFORD 2, CONN.

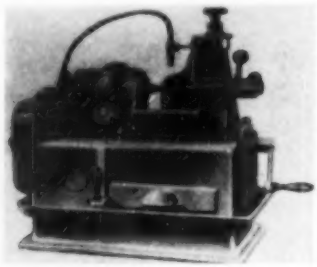


Steam-Jet Cleaner Combines High-Pressure Steam, Detergent

The Speedelectric steam-jet cleaner JC-30 delivers high-pressure steam and a soap solution or detergent through separate hoses, to a steam lance. Here solvent or detergent is atomized, mixed with the steam, and sprayed, at high speed, on the object to be cleaned. The unit does not dilute solvent, is said not to flood the working area, and is reported to operate silently without sparks, fumes, or flames. Solvent or detergent can be applied separately or mixed with the steam in any desired proportion. There are no coils or tubes to scale or burn out; no motors, pumps, or moving parts to wear out. The cleaning unit weighs about 500 lb and is mounted on an all-steel dolly with ball-bearing rubber-tired swivel casters. Included with this equipment are high-pressure steam and detergent hose, nozzle, and controls. Floor space required is 27 x 40 in.

The machine operates on ac current, 220 v and over, single or polyphase. The boiler has a capacity of 30 kw and is ASME National Board stamped and Underwriters' Laboratories listed.

Livingstone Engineering Co., 100 Grove St., Worcester 5, Mass. **Booth 11**



Automatic Machine Hobs Small Precision Gears, Pinions

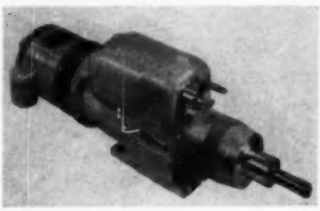
Koepfer Automatic Gear Hobber machines small gears and pinions for precision instruments. The unit is said to be of simple construction and to provide easy setting and operation. It can be driven from fast and loose pulleys or directly from individual motor. No countershaft is required. The milling cutter is driven from the main drive by exchangeable silk-belt pulleys, allowing for eight different milling-cutter speeds.

The milling-cutter spindle is of high-quality special steel, hardened, ground and lapped, and wear can be taken up by adjustment of the spindle. Vertical adjustment is by a micrometer screw with graduated scale. At the beginning of the operation the work is brought into the right position by means of a lever. After the cut has been finished the milling-cutter spindle drops automatically. When the machine is working, the adjustable spindle is positioned against a position stop.

From the spindle bearing the drive goes over helical and hardened bevel gears to the dividing change gears which are used for setting the number of teeth required. Any number of teeth from 6 to 200 can be obtained with the exception of the prime numbers between 120 and 200. Feed is taken directly from the main spindle simplifying operation and setting. The changes in the milling length or number of teeth have no effect on the feed per work revolution once it has been set. Standard equipment includes eight change gears for eight different feeds. For the feed regulation the same change gears as for the dividing mechanism can be used.

The tailstock is cast integrally with the headstock and embodies a quick-chucking arrangement. Main spindle is bored out to take the chucking attachments, and is also suitable for collets. The drive runs in oil bath. Max milling is 2 in.; min, 5/64 in.; max milling length, 1⅝ in. Max dp is 25.4 and min, 169.33. The eight milling cutter speeds range from 230 to 1570 rpm and eight feeds from 0.004 to 0.035 in. per rev of work.

George Scherr Co., 200 Lafayette St., New York, N. Y. **Booth 209**



Air-Hydraulic Drill Unit Offered in Three Sizes

Air-hydraulic drill units are available with direct-motor drive, gear drive, or pulley drive. Drillheads are equipped with built-in recycling switch providing for full electrical remote control. Electric motor is used only for the spindle drive and compressed air is the prime mover for power feed of the spindle. Power feed is controlled by metering hydraulic oil in the unit's sealed hydraulic system. The drill can be operated by a manually controlled four-way air valve, by remote control, or (for automatic operation) by a solenoid-operated four-way air valve. Accurate adjustments for spindle travel, rapid approach to work, metered feed control, and dwell are provided.

Model 2 is available with motors up to 1½ hp and 1½-in. spindle travel; Model 3 with from ¾ to 1½ hp and up to 4 in. spindle travel; and Model 5 with from 2 to 5 hp and 6-in. max spindle travel.

Delta Mfg. Div., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis. **Booth 843**

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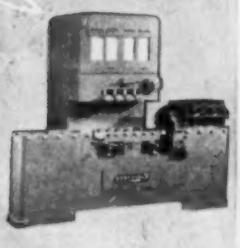
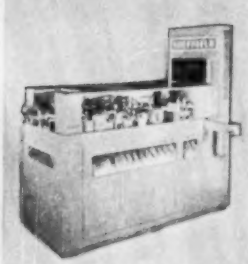
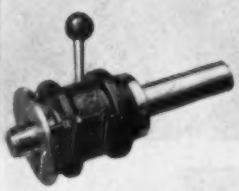
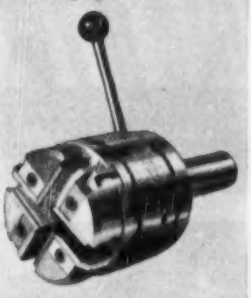


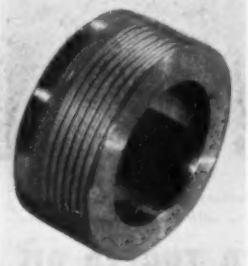


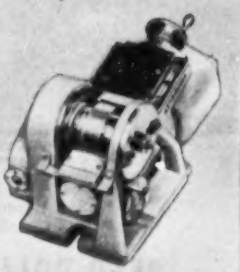
Lowest Cost Inspection With Sheffield Automatic Gaging





Lower Cost Per Thread With Murchey Threading Tools





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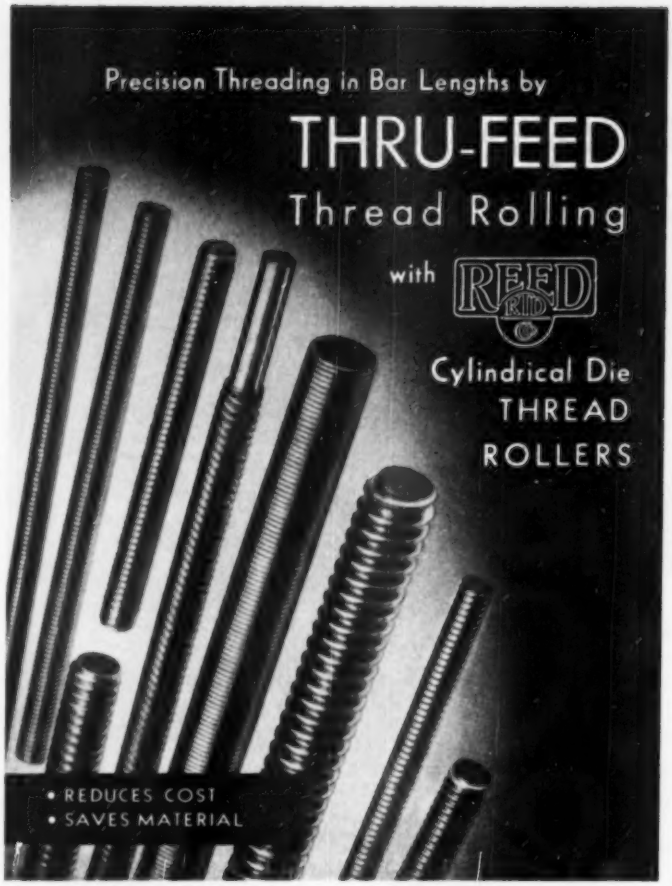
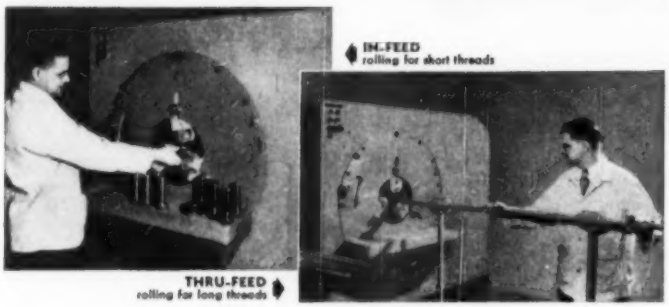
BOOTH 836 The Center of The Show Where The Two Main Aisles Meet

5496





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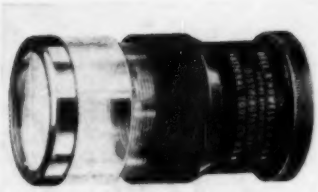


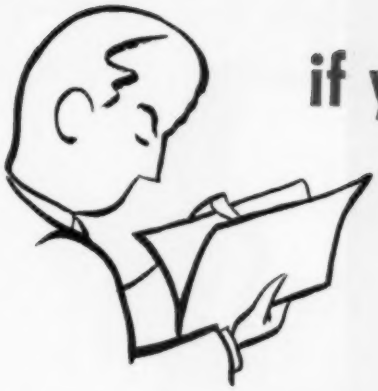
Pocket Measuring Instrument Inspects Small Dimensions

The pocket comparator is a high-precision optical measuring instrument for the inspection of small parts or small dimensions on large parts. Through a magnifying lens the user may compare the part to be checked against a finely calibrated pattern or reticle. The triplet-design aplanatic lens has a magnification of approximately 7 to 1. The comparator is calibrated for measuring lengths, widths, complete circles, radii, and angles. Threading, in the middle of the comparator, permits separation and cleaning of the interior optical surfaces and also provides for adjustment of focal length to meet the eye requirements of the user.

National Tool Co., 11200 Madison Ave., Cleveland 2, Ohio **Booth 760**

Hydraulic Machine Marks Flat, Round, and Contour Surfaces

One control on the Cadillac 45 hydraulic marking machine gives full range of marking depth and up to 12,000 psi can be applied for a wide variety of marking requirements. Repeat action, fast slide return (up to 110 one-inch strokes per minute), and completely enclosed motor and mechanism are built into the unit.



if you're looking for a low-cost way to electroclean brass...

You are reading about a *new Oakite brass-cleaning formula.* One that combines the three outstanding essentials you've long sought after; (1) effective removal of oils, buffing compounds; (2) prevention of tarnish; (3) high tolerance for chromic acid carry-over. Designed for use in cathodic-anodic or soak-anodic cleaning procedures, Oakite's new formula assures high conductivity; eliminates surface scums and water breaks in acid dips, has exceptionally long cleaning life.

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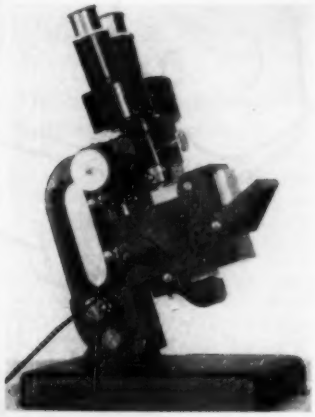
The hydraulic system is manifold mounted and can be removed as one unit for servicing without dismantling the machine.

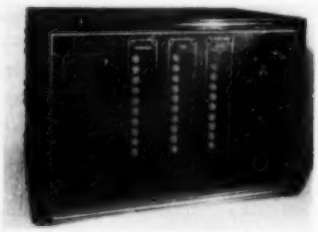
Cadillac Stamp Co., 2138 Riopelle, Detroit 7, Mich. **Booth 753**



Comparison Microscope Tests Machined Surfaces for Finish

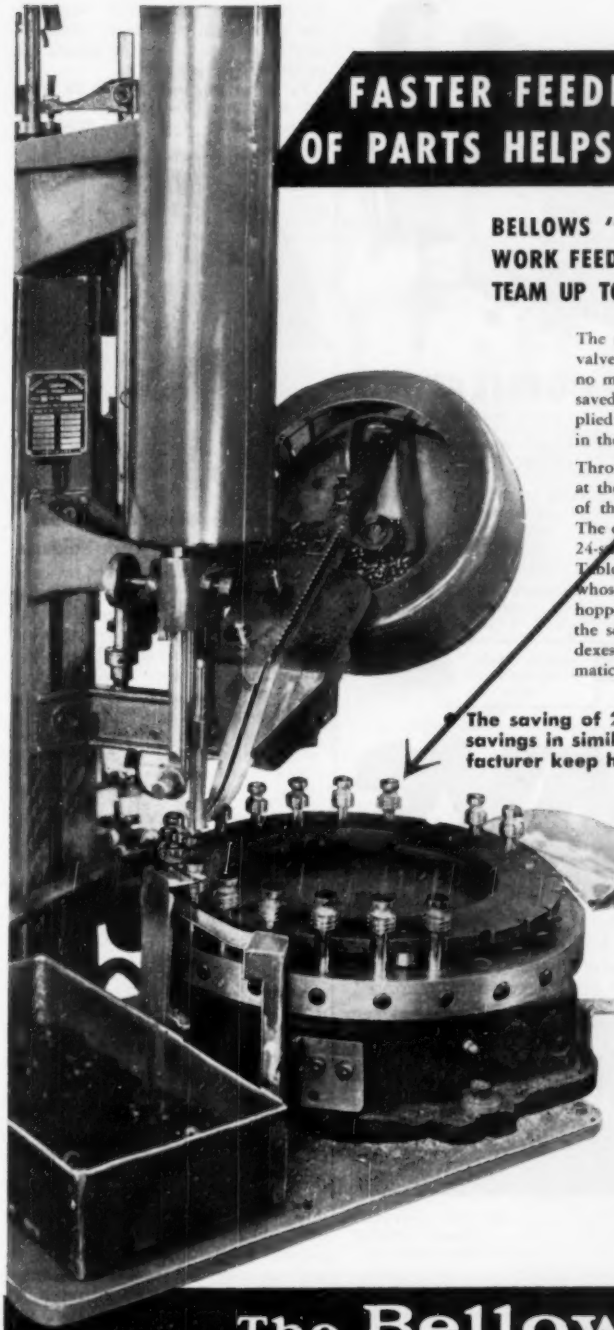
Leitz comparison microscope checks machined surfaces for quality of finish. A sample piece having the approved finish is placed on one stage while the work is placed under the objective below. The two images appear alongside each other without any separation, making possible close comparison. The microscope produces a three-dimensional stereoscopic image. A special transformer permits light adjustment to bring out the grinding marks of the finish.

George Scherr Co., 209 Lafayette St., New York, N. Y. **Booth 209**



Electronic Counter Ends Cycle After Predetermined Run

With this electric counter length of runs on certain operations can be determined and preset to any number from 1 to 999 by pushbutton keyboard. At the end of the run the counter can be set to repeat the run or turn machinery off. Operating from a photocell, magnetic pick-up, sound impulse, or from any



FASTER FEEDING AND EJECTION OF PARTS HELPS CUT COSTS 25%

BELLOWS "CONTROLLED-AIR-POWER" ROTARY WORK FEED TABLE AND BELLOWS AIR MOTORS TEAM UP TO MAKE HAND OPERATION AUTOMATIC

The cost of inserting the washer and screw in the valve stem of a water faucet isn't a major cost item, no matter how it's done. But a fraction of a penny saved here, a fraction of a penny saved there, multiplied by thousands of parts, adds up to major savings in the total cost picture.

Through the ingenious toolroom-built device shown at the left, a mid-western manufacturer cut the cost of this operation 25% under the old method used. The operator loads the valve stem and washer in the 24-station Bellows Rotary Work Feed Table. The Table positions the part under a power screw driver whose spindle is fed by a Bellows Air Motor. The hopper-fed screw is driven to correct pressure, and as the screw driver retracts the Rotary Feed Table indexes to the next position. A third Air Motor automatically ejects the part.

The saving of 25% in this operation, coupled with like savings in similar production processes helps this manufacturer keep his favorable competitive position.

YOU, TOO, CAN CUT PRODUCTION COSTS WITH BELLOWS "CONTROLLED-AIR-POWER"

No matter what you make chances are good [illegible] your plant where Bellows Work[illegible]ds, Bellows Air Motors, Bellows [illegible]ng Devices, and other Bellows "Controlled-Air-Power" Units can help you save important money.

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See
"Controlled-Air-Power"
in Action

The Bellows Co.

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Any plant doing high speed precision shearing on smaller parts cannot afford to be without the DI-ACRO POWERSHEAR. Available in 12" and 24" shearing widths, capacity 16 gauge sheet steel. Also standard model.

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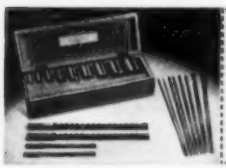

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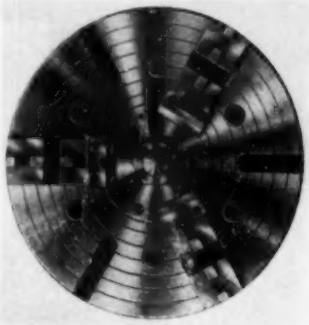
mechanism or electrical variable, the counter is capable of counting objects or operations at speeds up to 20,000 per sec.

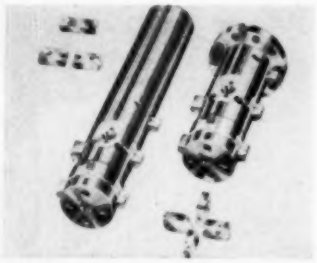
Ferguson Machine & Tool Co., Inc., 471 Paul Ave., Ferguson Station, St. Louis 21, Mo. **Booth 831**



Compensating-Jaw Power Chuck Eliminates Special Work Holders

With the Cushman three-jaw compensating power chuck, it is not necessary to use fulcrum-type top jaws or other special workholding devices for a large range of irregular-shaped work. It is claimed that work can be set up more quickly and more accurately, and can be gripped with maximum factor of safety without stress on the work center.

The Cushman Chuck Co., Hartford, Conn. **Booth 866**



Car-Wheel Boring Tools Have Cemented-Carbide Cutters

Increased car-wheel boring output is reported with this four-cutter boring wheel. Tools are provided with cemented-carbide cutters, and are said to be particularly adaptable to use on modern boring machines. Feed rates are doubled, cutting boring time in half. At 70 rpm the roughing feed is 0.08 in. per min. Rough-boring time for a 7-in. hub is 1.25 min.

Davis Boring Tool Div., Giddings and Lewis Machine Tool Co., Fond du Lac, Wis. **Booth 230**

Rotor's 15 New "Multi-power" Chippers are easier to handle . . . do jobs faster

The unique hollow piston and "doughnut" valve of the 15 new Rotor "Multi-power" Chipping Hammers provide the 1-2 punch to cut your chipping costs.

Lighter Weight. These new Rotor Chippers average 1½ to 2 lbs. lighter than other chippers making them easier to handle.

Shorter. Exclusive "doughnut" valve makes possible saving of 1″ to 2″ in length, making it easier to get into those tough, crowded corners.

Faster Cutting. You get more blows per minute . . . because of new exclusive design.

3 Models in 1. By a simple change of parts you can adapt each of the 5 basic models to serve as 3 hammers to match your job: (1) A "regular" model, (2) A "super-speed" model, (3) A "super-sock" model.

This is the biggest advancement in chipping hammers in the past 15 years! Find out all about it! Write for catalogue No. 37.

AIR O'TOOL

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with NOBLEWEST rapid production marking machines

Are you using modern methods and equipment for marking the products you manufacture? Right now Noblewest Rapid Production Marking Machines are helping many manufacturers to meet present business conditions by speeding up production—increasing efficiency—through faster, better marking at lower cost. For example, Model No. 286, shown above, is tooled for marking GE capacitors. The inscription, shown at right, being permanently *rolled in,* lasts as long as the product itself. Noblewest equipment can be used for marking metal, plastic, hard rubber, etc. Marking speeds are practically unlimited. Every Noblewest Marking Machine is engineered to meet your specific requirements, and backed by the skill, experience and facilities of the world's leading manufacturer of rapid production marking equipment. Whatever your marking problem, Noblewest engineers will be glad to make time and money-saving recommendations without obligation to you. A copy of our new catalog on Modern Marking Methods will be sent upon request. Write to NOBLE & WESTBROOK MANUFACTURING CO., 17 Westbrook St., East Hartford 8, Conn.

Lapping Tool Provides Constant Pressure Between Sleeves, Work

The Ideal Xpand-O-Lap is a self-aligning self-adjusting lapping tool which provides constant pressure between lap sleeves and work. It consists of one steel arbor, two serrated copper sleeves, and one S-shaped pressure spring. The spring applies constant, even pressure against the two sleeves. Diagonal grooves in the sleeves serve as channels for the lapping compound, assuring uniform distribution.

The only servicing the Xpand-O-Lap requires is the occasional replacement of sleeves or pressure springs; operations which require only a few seconds. Complete sets include one lapping tool of each of the following sizes: ⅛, 3/16, ¼, 5/16, ⅜, and ½ in. Two extra sets of sleeves and one extra spring are included for each lap.

Ideal Industries, Inc., Park Ave., Sycamore, Ill. **Booth 1048**

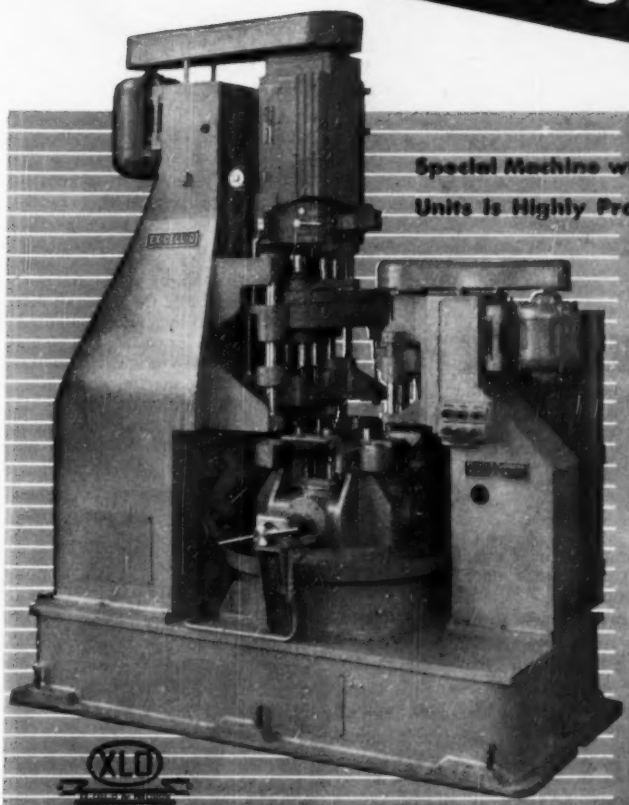
Metal-Polishing Abrasive Molded in Stick Form

Fine-grain abrasive material is held together by a flexible bond and molded in stick form to create the Ideal Flexible Abrasive, for cleaning and polishing metals. It is non-dusting and, when held against a turning commutator, it removes high-resistant film, dirt, and grease. The abrasive is both non-conductive and non-loading.

In machine shops the Ideal Flexible

WANT TO CUT COSTS?

See EX-CELL-O



Special Machine with Ex-Cell-O "Package" Power Units Is Highly Productive . . . Low in First Cost!

Ex-Cell-O machines for combined operations save floor space, save handling, save man-hours. When Ex-Cell-O's standard hydraulic power units are used for feeding and rotating the cutting tools, the first cost is low. The Ex-Cell-O special machine shown to the left drills nine holes, reams one hole, and taps three holes in cast iron water pump body at a net rate of two parts per minute! If your production involves operations like this, get in touch with Ex-Cell-O in Detroit today!

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abrasive removes tool marks, scratches, or rust, leaving a highly polished finish on almost any metal. It is made in five sizes from ⅜x½x5 in. to 1x4x5 in.

Ideal Industries, Inc., Park Ave., Sycamore, Ill. **Booth 1048**

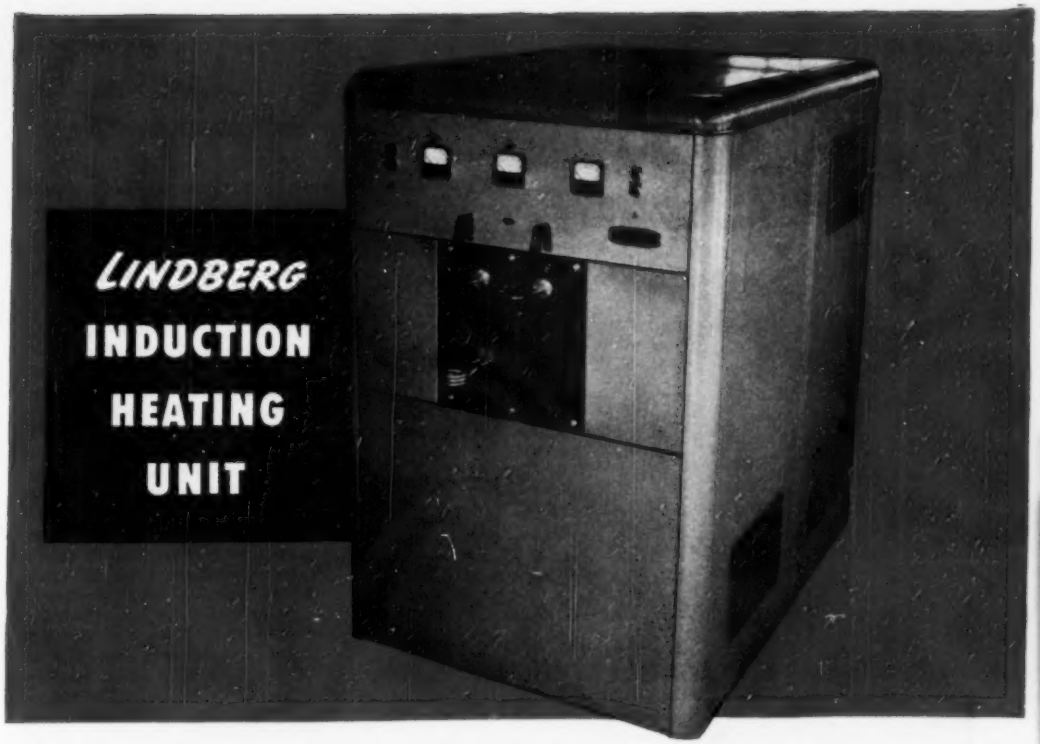
Dial Indicator Built With Dynamically Balanced Hand

The hand of the "B" and "C" size Federal dial indicators is designed with the weight of the pointing end counterbalanced by a short weighted section on the opposite end. This concentration of weight near the pivot eliminates inertia which normally causes a whipping action.

Federal Products Corp., 1144 Eddy St., Providence 1, R.I. **Booth 305**

SHEET METAL FABRICATOR punches, notches, and nibbles sheets, angles, channels, and extrusions up to ¼-in. mild steel. A foot switch permits freedom of both hands to handle work during operation. *Wales-Strippit Corp., North Tonawanda, N. Y.* **Booth 908**

Continued on page 270



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Available in single and two-station models the Lindberg LI-25 is ideal for hardening, brazing and soldering, annealing and stress relieving, hot forming and light forging, shrink fitting and other induction heating applications.

The Lindberg LI-25 is a ruggedly constructed vacuum-tube type unit for hard working production line jobs. Oscillator tube, power transformer and other major components deliver a full 25 KW with plenty of reserve to insure dependable day in and day out performance. Well designed—safe and simple to operate—featuring the most desirable developments in high frequency heating.

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"CHECKLITE"—a unique feature exclusive with this unit, makes servicing easier, reduces maintenance costs.

AUTOMATIC CONTROL—when job cycles are set, automatic timer controls every phase of the operation—heat, quench, fixture movement.

SAFE AND SIMPLE—both operator and operating parts are protected—filament voltages are constantly regulated—tank capacitor is hermetically sealed—work coils protected against burn out. Every unit certified to meet FCC regulations. For detailed information write for Bulletin T-1420.

For specific application information contact your local Lindberg Office, or write describing your problem in detail.

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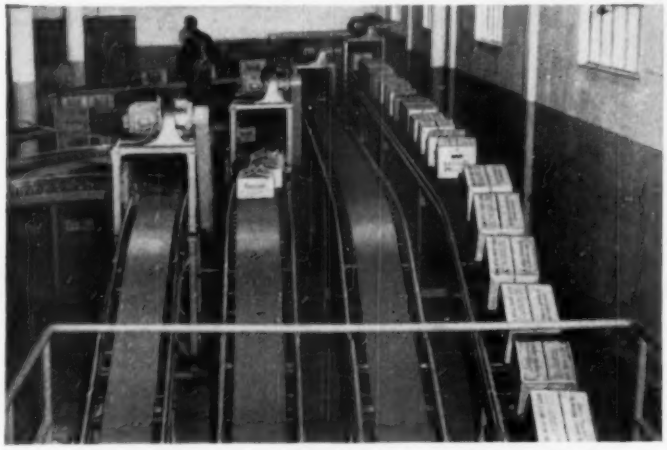

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— compact, mobile, easily maneuverable power-belt conveyor unit—handles packages up to 150 lbs.—reaches into cars, trucks, trailers. Available in 4 sizes — 2 models.

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ROUND TABLE Discussion

TEN O'CLOCK SCHOLAR

In order to tackle this problem with any hope of success, Al and Ed must first be certain of their own timekeeping record. Observing the mote in the other fellow's eye sometimes blinds us to the beam in our own. Management by example is a powerful factor in encouraging good conduct, although the shellbacks will try to take advantage of the finest of managements. The paying line with them is the big stick.

It is the writer's experience, in thirty years of handling labor, that there is no change to be got out of appeasing the habitual latecomer. His bad habit stems straight from a lazy disposition, and laziness is incurable, like hoof-and-mouth disease in cattle and, figuratively speaking, is better treated in the same manner, i.e., by slaughter. To treat the habitual offender tenderly is an insult to all good timekeepers and may be regarded as serving notice on them that good timekeeping has no special value in the eyes of the higher ups and that exemplary conduct simply does not get them anywhere.

Undue tenderness toward habitual offenders has a tendency to make the dependable ones resentful and dissatisfied, to the detriment of shop atmosphere and economical production. Too often in industry do we see the scalawag being pampered, humored and coaxed at the expense of the salt of the earth and it is a commonplace in British industry today that the "open sesame" is mostly for those who make themselves busy minding other peoples affairs or who make bloomers big enough to cause them to be moved, the move being generally for the better so far as the offender is concerned.

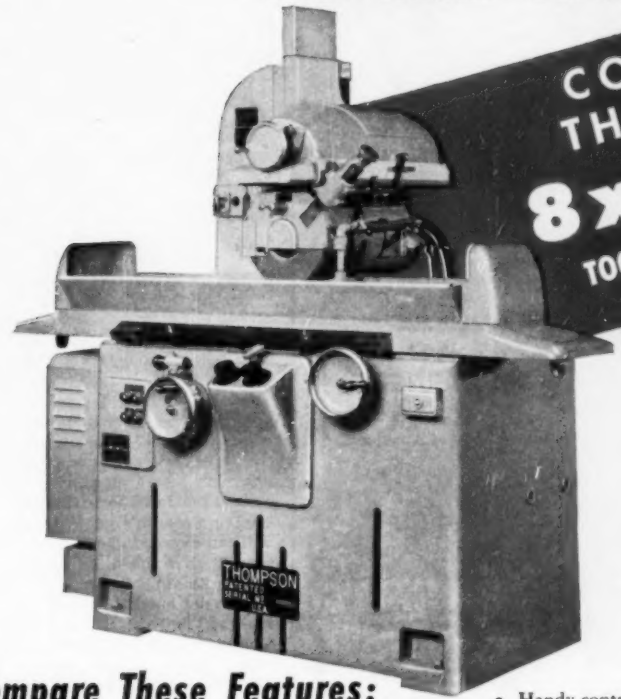
Round about 1919, the writer was employed in a world famous Clyde shipbuilding yard. The chief rate-fixer in a shipyard holds down a most important job and, generally speaking, is quite aware of the fact. In this particular yard the chief rate-fixer had a habit of blowing into his office round about 10 a.m. and after a look at the morning paper would dodge uptown, returning to the yard about 11:30 smelling of the best "scotch."

Few afternoons passed without another visit to his favorite pub, between which activities he would run a critical, if befuddled eye, over the work which his assistants had ac-

Announcing The New Thompson Type 2F

SUPER PRECISION

Tool Room Grinder

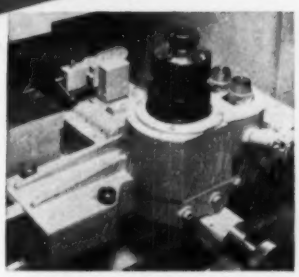


COMPARE THIS NEW

8 x 10 x 24

TOOL ROOM GRINDER

(Write for specifications)



MAGNIFIED TEMPLATE DIAMOND WHEEL DRESSER with ten to one magnification available in universal manually operated and electric. Other auxiliary Thompson Type 2F equipment includes "Coolant Thru the Wheel" feature and Magnetic Chucks with control.

Compare These Features:

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- HARDENED AND GROUND BED WAYS with automatic lubrication.
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- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

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Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

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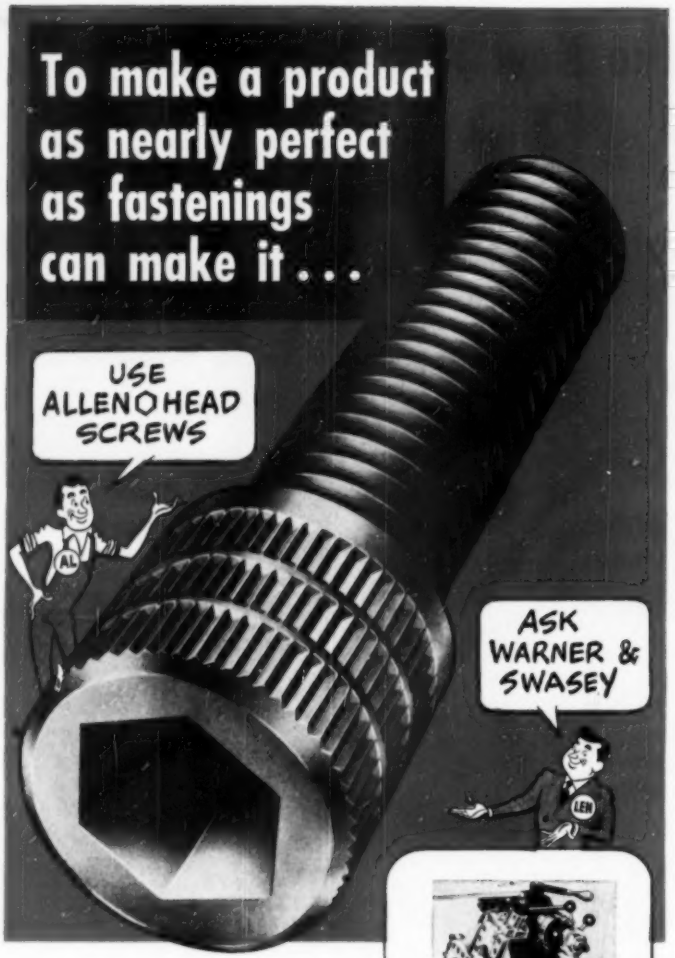
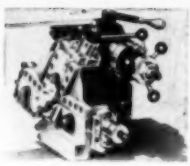
To make a product as nearly perfect as fastenings can make it . . .



The only place to use a cheap screw is when you don't care if it holds or not. Usually shearing or loosening costs thousands of times what you "save" on the cheapest fasteners.

You pay no premium for *genuine* Allen Head screws—only enough to *assure* uniform strength and Class 3 fit.

Allen gives you the toughness of Allenoy steels, 100% Pressur-forming, the advantage of every proved threading method, quality control at every step, including automatic instrument controlled atmosphere heat treating.



This leading machine tool manufacturer uses Allen Head screws by the hundreds of thousands for compact design, assured holding power and maintenance of precision adjustments.

SOLD ONLY THROUGH LEADING DISTRIBUTORS
Write the factory direct for technical information and descriptive literature.

WARNING
Allen-Type screws aren't necessarily Allen-Made.
Get genuine Pressur-formed Allen Head screws in this black and silver box.

ALLEN ALLEN HEAD
MANUFACTURING COMPANY
Hartford 2, Connecticut, U. S. A.
NEW YORK, CLEVELAND, DETROIT, CHICAGO, LOS ANGELES

complished in his absence. A clever man, who undoubtedly knew his job from A to Z, he was reputed, generally, to be irreplaceable, those making that statement never, of course, paused to consider what would happen should he unexpectedly die. He had an unique philosophy in matters pertaining to appreciation and promotion, etc., as the writer was to learn when on one occasion he suggested that a day of reckoning was in the offing if he did not mend his ways. The writer had no jurisdiction over him and tendered the friendly advice in the interests of his wife and family.

It fell upon deaf ears, however. He brushed it lightly aside with the cocksureness of the confirmed lead swinger. He said "that's just where you are wrong, you don't know the directors of this company. If I arrived here punctually every morning at nine and slaved all day to 5:30 they would take it all for granted, in fact they'd forget I was on the strength. As it is, they show their pleasure if they *do* happen to get me in when they come round. I'll be here when you are not." Well, he wasn't.

Some time later the general manager saw him coming unsteadily towards the yard in the late afternoon; the next day he was absent. As he left the office that evening, the cashier handed him an envelope containing a month's salary in advance, with an expression of regret that he should have been so foolish. His chief assistant stepped up and calamity did not befall the yard. In a few months' time Mack was forgotten and keels were laid, frames were set, rivets were staved, seams were caulked and ships were launched just as if foolish "irreplaceable" Mack had never been. Persevering with him paid no dividends, and it's the same with all habitual offenders who are usually thought to be irreplaceable. A good plan is to encourage the good ones and fire the rotters. A bad tooth is always better out.

C. D. Mackinnon
Lanarkshire, Scotland.

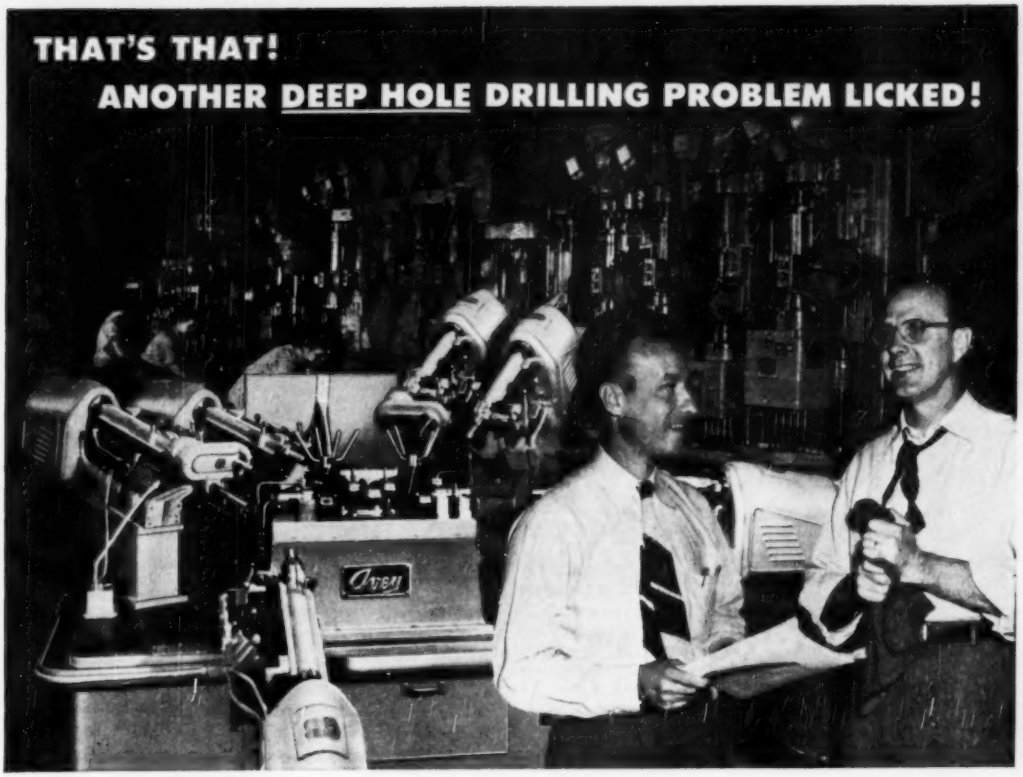
•

HOT POTATO

IF A MAN has planned to take a vacation starting on a certain date, then that arrangement should be held inviolate, no matter what rush jobs come into the shop. There are some things in life that are more important than work, such as being born, getting married, dying and vacations.

It all depends on your philosophy. If you regard vacations as being an important part of life, then you will

THAT'S THAT!
ANOTHER DEEP HOLE DRILLING PROBLEM LICKED!



I'll never forget that day! We had four angular oil holes plus end drilling operations on that crank. And we'd tried all kinds of step drilling units. Best we could do was eleven cranks an hour . . . and we were knee-deep in snapped drills most of the time.

Then somebody got wise and checked into Avey's deep-hole drilling unit, the *Avey-Draulic*. We sent 'em the specs, and asked 'em what they thought they could do. Boy, they told us! And, then, here it came—that special machine right there.

Well, we ran off one lot of cranks, and checked. Couldn't believe my eyes! The drills were almost like new. We tried a production run-off, and Charley (he's our Production Chief) darned near fainted. Seventeen finished cranks an hour . . . with feeds and speeds at a maximum.

You needn't sell us on *Avey-Draulic* Units for deep hole drilling jobs . . . we're sold!

The above story is typical of the many plants where the Avey-Draulic is making new records in deep hole drilling. Ask us about it. Write for Engineering Bulletin **302.**

Avey

DRILLING MACHINE COMPANY, CINCINNATI 1, OHIO

DRILLING AND TAPPING UNITS
AUTOMATIC INDEX TABLES
DEEP HOLE DRILLING MACHINES
SPECIAL DRILLING AND TAPPING MACHINES

A dollar spent with Avey buys a dollar's worth of service, too!

THE BEST AGENTS EVERYWHERE SELL . . . AVEY

don't scrap metal by turning!

...save by Swaging on TORRINGTON SWAGERS

The Torrington Rotary Swaging Machine uses every bit of stock. With 4000 hammer blows a minute, swaging reduces, sizes, rounds, tapers and points rod, wire and tubing. It makes metal tougher and more resilient. It hammers away minor surface defects.

Torrington Swagers are built to a mechanical perfection based on our 42 years' swaging experience. Send today for your free copy of the illustrated booklet describing the machine and the method.

THE TORRINGTON COMPANY
Swager Department
559 Field Street • Torrington, Conn.

Send the coupon today for your free copy of this booklet.

Please send a copy of "The Torrington Swaging Machine" to:

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Address_____

get your vacation. If you regard vacations as things to be put off, then you will never get them when planned, and I do not think you deserve to have them anyway.

Whether or not a man can take a vacation after he has planned it does not depend on pressure of work, how the boss feels or which way the trade winds are blowing; it depends on resolute determination by the would-be vacationer that he is going away on a certain day as certainly as the sun can be expected to rise on that particular happy morning. If this resolve is plugged hard for several months prior to the vacation date, and dinned into the ears of all interested parties, then the date will rate equal importance with Christmas.

When I lost about four vacations in a row owing to the unexpected rush job rearing its ugly head, I realized that a firm stand would have to be taken about vacations. I accordingly applied the technique described above. I was engaged on ship repairs, but I announced in good time that I was taking my next vacation on a certain date, and no amount of rush work was going to prevent it. Even if the *Elizabeth* and *Mary* were stuck in dock on my account, I was going.

Sure enough, half an hour before I left the plant to get on the train to the seaside, the inevitable rush job arrived. But I got on the train just the same.

What happened? Nothing at all.

The rush job was done, the ship left port on time, I had my first decent vacation in five years and the boss boasted about the way the job had been completed during my absence, as if to say "You're not as indispensable as you think you are, Riley."

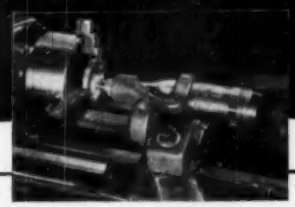
Of course I was not indispensable! I had trained my assistants to take over in my absence and I made sure that somebody competent was in charge while I was away. The vacation dates of my assistants were planned in January. I saw to it that the dates were adhered to.

Employers get panic-stricken when faced with an important rush job. They want every man at his post in case of need. Nine cases out of ten the man who has put off his vacation finds that he was not needed after all. It has happened to me too many times. It is also surprising how the number one rush job in a shop drops down on the priority list to give way to the new job. Too many medium-size shops suffer from this form of greed and make the lives of their employees miserable.

The stopping of a man's vacation

ACCURACY TO .0001"
IN PRODUCTION SET-UPS

FOR AS LITTLE AS **$1175.00**



Internal grinding on lathe with PRECISE wheel arbor mounting 1½" D. wheel.

LOWEST COST PRECISION. When mounted on standard machine tools, PRECISE SUPER 40 at speeds from 20,000 to 45,000 R.P.M. turns out precision jobs heretofore possible only on stationary machines costing up to 100 times as much.

VERSATILITY. For cylindrical, internal, external and form grinding; for milling with H.S. steel or tungsten carbide midget mills; for micro-finishing and polishing. Use on wood, glass, rubber, plastics, or any metal including the hardest alloy steel.

DURABILITY. All metal housing, rigid PRECISE quill, lubricant-sealed micro-precision bearings. ¼ H.P. AC-DC motor (115 volts) is protected by replaceable fusetrons.

ATTACHABLE COOLFLEX SHAFT. (optional) Quickly attached for bench work and hand-tool applications. Same speeds, same precision quill as in PRECISE SUPER 40.

Milling hardened die with tungsten carbide mill in COOLFLEX ATTACHMENT.

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1340 Clark Street,
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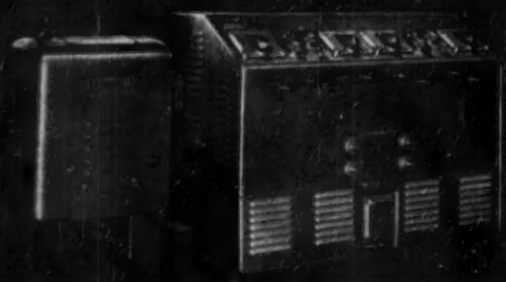
PRECISE SUPER 40

Power Unit with cabinet removed; valves are gasket mounted to simplify installation, save space, improve machine appearance.



Power Unit having pump driven by standby gasoline engine.

VICKERS Hydraulic POWER UNITS *Custom Built*

Illustrated here are representative examples of the infinite variety of self-contained hydraulic power Units that are designed and built by Vickers for the more efficient operation of many kinds of machinery. These compact Units include all necessary pumps, valves, intermediate piping, reservoir, hydraulic accessories, motors and controls. Hydraulic connections to the machine are grouped in a convenient manifold.

Design is simplified because arrangement is not limited by structure of machine. Installation time and cost are substantially reduced because all hydraulic equipment is received as a self-contained "package" instead of separate parts that must be individually installed. Every Unit is pretested at factory and is ready for immediate operation. Cabinets which are optional, blend well with modern machine design. Operating adjustments and maintenance are simplified by convenient layout and gasket mounted valves. Vickers Custom Built Power Units have other important advantages . . . ask for Bulletins 47-45 and 46-43.

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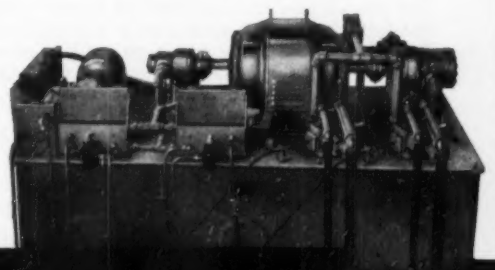
- **Simplify Design**
- **Reduce Installation Costs**
- **Improve Appearance**
- **Save Time**
- **Easier Maintenance**



Power Unit is placed in base of machine . . . console control where convenient to operator.

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Incorporated
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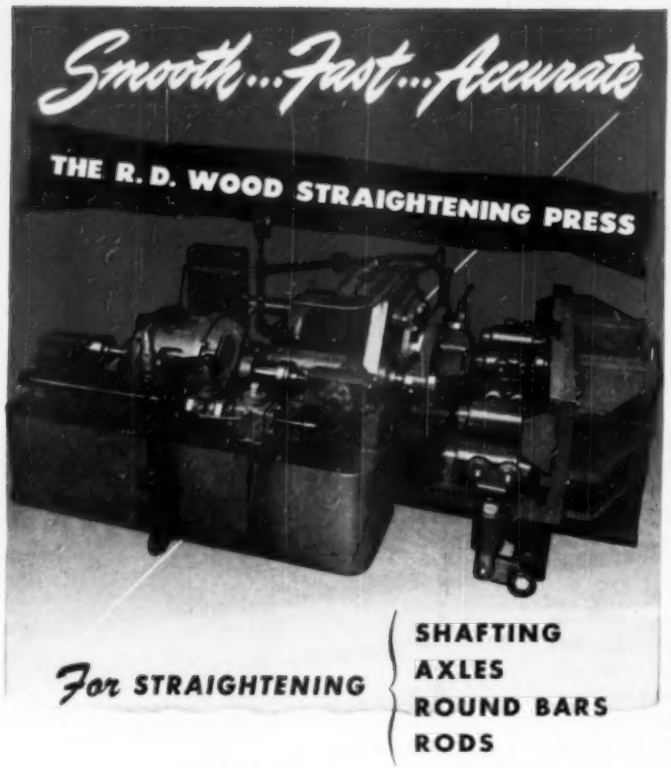
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Application Engineering Offices: **ATLANTA • CHICAGO • CINCINNATI CLEVELAND • DETROIT • HOUSTON • LOS ANGELES (Metropolitan) MILWAUKEE • NEW YORK (Metropolitan) • PHILADELPHIA • PITTSBURGH • ROCHESTER • ROCKFORD • ST. LOUIS • SEATTLE • TULSA WASHINGTON • WORCESTER**



The modern design and quality construction of this 200-ton R. D. Wood Shaft Straightening Press are your guarantee of smooth, fast, accurate handling of work . . . *plus* increased production.

The press frame is constructed of heavy welded steel and carries individual cast steel main and pull-back cylinders. Press table is 73" long with a gap of 13" between dies. Resistance blocks are movable on the vertical frame face. The table is provided with four heavy stationary rollers for shifting shafts lengthwise, as well as four sets of lifting and turning rollers operated by an air cylinder. An adjustable stop, which will take full press load, is located in the center of the press frame to prevent over-bending. High and low pressure pumps, operated by a 20-hp motor, provide a ram speed of 72" per minute for low pressure closing. High pressure ram speed is 8.5" per minute. Send today for descriptive literature. R. D. Wood Company, Ledger Building, Independence Square, Philadelphia 5, Pa.

When faced with problems involving hydraulic presses and equipment, it will pay you to consult with R. D. Wood engineers.

HYDRAULIC PRESSES AND VALVES FOR [illegible] • ACCUMULATORS • INTENSIFIERS

R. D. Wood Company

is evidence of bad organization. If a man has become so indispensable that a rush job cannot be turned out without nursing it along, then it is high time some upgrading and training of personnel was started. The indispensable man will not last forever. It is highly probable that he will not survive the normal life span.

If you really want vacations, and you regard them as of major importance, then you must set about selling the idea to the people who can affect them. I know it is difficult in American plants to propagate this idea where the gospel of work for its own sake is preached. But there is no doubt that guaranteed vacations make for contentment.

F. E. Riley
London, England

•

EXCUSE ME, PLEASE

I believe courtesy has its place in the machine shop, as in any other walk of life. The dictionary definition of this sometimes scarce commodity is as follows, "politeness, combined with kindness; civility." Like all the other amenities, of course, it can be overdone; for instance, there is no place for the Alphonse and Gaston type of business in the machine shop. But there is time and place for courtesy of the man-to-man type, that recognizes the dignity of the individual, where "please" and "thank you" is not considered servile, or "sissy."

I think the foreman who is courteous in his dealings with the men has a tremendous advantage over the type of person who is abrupt and discourteous in speech and action. If an employee knows he can approach the foreman readily with any problem he has on his mind and have it discussed or explained in a reasonable manner, he is less likely to make mistakes and more ready to cooperate than if he has to approach his foreman "in fear and trembling." During a long experience in the shop I have worked for both types of foreman, and in every case I found the courteous considerate, individual was worth more to the company in terms of production achievement than the so-called "hard-boiled" type.

In one particular shop where I spent some time as a young journeyman, the foreman was an irritable, cranky, individual whose usual mode of address was, "Hey you!" whenever he required the services of any of the men. If a man made a mistake, even the difficult acoustics of a busy shop couldn't prevent his neighbors within a fifty yard radius from hear-

17" Multiple-Spindle (8) Drill Press - $1579.00

DELTA
MILWAUKEE

Single-spindle drill presses ...or batteries a block long!

DELTA® the most complete line

17" Floor-Model Drill Press $172.00

14" Floor-Model Drill Press $109.00

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14" Super-Hi® Drill Press $151.50

17" Floor-Model Power-Feed Drill Press $267.00

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Motor and switch extra. Prices subject to change without notice.

TALK about selection! There are 144 different drill presses in the big Delta line. Every one is tops when it comes to drilling — and versatile enough to do over 36 different additional jobs, besides!

Naturally you can find the exact machine your job calls for in such a complete line — with the right number of spindles, the right chuck capacity, the right speed — *and at the right cost!*

There are 14" and 17" models . . . floor and bench types . . . single spindles . . . multiple-spindle batteries . . . individual heads for special set-ups . . . power-feed and foot-feed machines . . . high-speed, super-sensitive models. Speeds range from 80 to 12,000 r.p.m. . . . capacities from .023" diameter to ¾" in cast iron. And, as you know, Delta quality is always the best.

What's more, you get this *same* wide selection in 42 other machines besides drill presses. Altogether, they make *Delta* the industry's most complete line of metalworking and woodworking machines. It's the only line with complete accessories to make every tool do more jobs — and often save you an investment in other machines.

That's why it pays to look to Delta first — for the right machine to do your job right. Send coupon for catalogs and bulletins on the entire Delta line.

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Rockwell
Manufacturing Company
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DELTA • MULTIPLEX • CRESCENT • HOMECRAFT
Sold only through authorized dealers. Easy time-payments!

Look for the name of your Delta dealer under "Tools" in the classified section of your telephone directory.

Tear out coupon and mail today!

Plus a complete selection of:

3 Cut-Off Machines · 2 Abrasive Finishers · 5 Grinders · Deburring Machine · 3 Band Saws · 3 Welders

6 Circular Saws . . . 4 Jointers . . . Scroll Saw . . . 4 Radial Arm Saws . . . 2 Shapers . . . 2 Saw-Jointer Combinations . . . Mortiser . . . Lathe . . . 2 Buffing Machines . . . 2 Planers. **53 Machines — 246 Varieties**

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M-47

Time Is Your Servant

Manufacturing costs have been increasing steadily year after year. The only way to reduce costs—without sacrificing quality and accuracy—is to cut production time. Then time becomes your servant instead of your master. In the production of precision gears, the Reishauer Type ZA Tooth Flank Gear Grinding Machine provides the perfect solution to this constant problem.

The ZA Grinder, operating on the generating principle, produces accurately ground gears on a production basis. The grinding time is appreciably faster than that possible by any other method, thus substantially reducing costs. For example, a 30-tooth gear, with a pitch of DP 36, and a ¼" tooth width, can be ground from the solid blank in 13½ minutes.

If you grind gears on a production basis; if precision plus high-speed production are important to you—then the Reishauer Type ZA Tooth Flank Gear Grinding Machine will be the ideal machine for you.

This ZA GRINDER and Reishauer's LEAD SCREW LATHES and THREAD CHASER GRINDERS are fully described in illustrated bulletins. *Send for yours today!*

COSA CORPORATION
405 Lexington Ave., Chrysler Bldg., N. Y. 17, N. Y.

NATIONAL REPRESENTATIVES FOR: REISHAUER—Gear & Thread Chaser Grinders—Lead Screw Lathes • BECHLER—Swiss Automatics—Cam Shapers • DECKEL—Engravers and Copy Millers • MICAFIL—Coil Winders • MIKRON—Gear Hobbers • SALLAZ—Burnishing Machines • SCHUTZ—Forming and Cutting-Off Machines • STUDER—Profile Grinders.

ing what this loudmouthed supervisor had to say in reprimand. Needless to say, the labor turnover in that shop was something to conjure with, for when business was good elsewhere the average mechanic avoided that shop like the plague. The machinist fraternity soon got the word around that this fellow was difficult to work for—and that was that!

No, Ed, as Al suggests, the hard-boiled guy is a relic of the days when the average machinist was a fellow who very seldom got beyond a grammar school education and thought a sixty-hour work week was the normal course of events, although he had dreams of some day getting Saturday afternoons all for his very own. Those were the days when the foreign born were streaming toward the shores of America, most of them bringing their inborn deference to the "man on horseback" with them. Then the driver type was in his heyday, and the average foreman or supervisor was expected to have some Simon Legree in his makeup.

Ah, those were the "good old days" that no one in his right senses would want to go back to! But times have a way of changing, the machinist of today is nine times out of ten a graduate of trade or high school, with a very clear conception of his rights as an individual. When he approaches a foreman or supervisor he does so expecting to be talked to calmly and reasonably, and should he make a mistake, reprimanded without bluster and histrionics. Very seldom is he disappointed in his reception, because foreman and management have learned the lesson of the years also. Courtesy pays off in wholehearted co-operation.

Robert S. Alexander
Greenville, R. I.

•

Courtesy is an essential asset to successful relations between a foreman and his men. No one but a moron would interpret courtesy as a form of yellow streak. A foreman who is firm, courteous, and considerate of the feelings of others—providing that he knows his stuff—is an executive of the highest type. Toughness is a necessary requisite in a fighter but not in a leader of men. You'll most always find that a man who displays a pugnacious front will use it as a coverup for the lack of something that he should have. Invariably that lack manifests itself in time as being an expert knowledge of the work he is engaged in.

"Courtesy doesn't imply weakness

Let's talk about

- ★ SPECIAL COLD FORGED PARTS
- ★ STANDARD CAP SCREWS
- ★ HARDENED AND PRECISION GROUND PARTS
- ★ SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST
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TOOL ENGINEERS'
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INDUSTRIAL EXPOSITION

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At the A.S.T.E. Show in the Philadelphia Convention Hall in April, you will have the opportunity to learn first-hand the many ways in which Allied's products and services can contribute to lower costs and greater production efficiency in your plant. As a reminder to visit our booth, it is a suggestion that you tear out this advertisement and drop it in the briefcase that you will carry to Philadelphia.

If you are unable to attend the Exposition, we will be glad to mail you full information on any or all of the products listed above.

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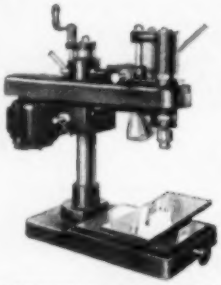
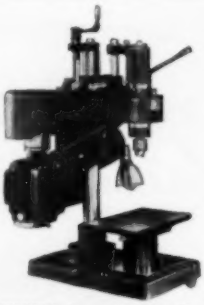
DEPARTMENT 51
12605 BURT ROAD DETROIT 23, MICHIGAN

ALLIED CORPORATION PRODUCTS — PRECISION · EXPERIENCE · DEPENDABILITY

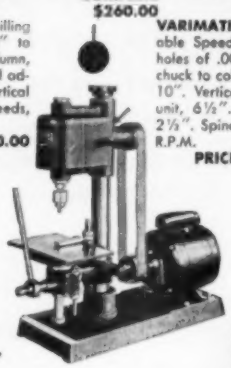


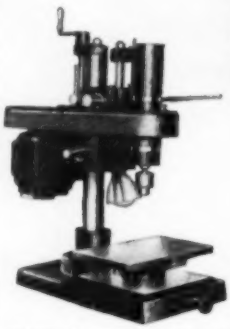
HAMILTON, Super-Sensitive Tapping Machine. Taps from the smallest and finest to 10-32 inclusive. Center of chuck to column, 3¼". Table to chuck, 4". Vertical adjustment of table, 3½". Vertical travel of table, 1¾". Spindle speeds, 1200 to 2600 R.P.M. **PRICE COMPLETE $260.00**

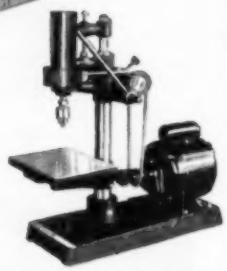


MAXIMUS, Super-Sensitive Drilling Machine. Drills holes of .004" to 5/16". Center of chuck to column, 8". Table to chuck, 10". Vertical adjustment of drilling unit, 10". Vertical travel of drill, 3". Spindle speeds, 750 to 8750 R.P.M. **PRICE COMPLETE $320.00**

VARIMATIC, Super-Sensitive, Variable Speed Drilling Machine. Drills holes of .004" to 5/16". Center of chuck to column, 5". Table to chuck, 10". Vertical adjustment of drilling unit, 6½". Vertical travel of drill, 2½". Spindle speeds, 840 to 9300 R.P.M. **PRICE COMPLETE $410.00**







FOUR DRILLS & A TAPPER

MAXI-JR., Super-Sensitive Drilling Machine. Drills holes of .004" to 5/16". Center of chuck to column, 5". Table to chuck, 8". Vertical adjustment of drilling unit, 8". Vertical travel of drill, 2½". Spindle speeds, 750 to 8750 R.P.M. (Special drive for higher speeds available). **PRICE COMPLETE $280.00**

A-M, Super-Sensitive Drilling Machine. Drills holes of .004" to .250". Center of chuck to column, 3¼". Table to chuck, 8". Vertical adjustment of table on column. Vertical travel of drill, 2". Spindle speeds, 788 to 9500 R.P.M. **PRICE COMPLETE $220.00**

FOR RAPID CONTINUOUS PRODUCTION OF

SMALL PRECISION HOLES

We believe that the line of Hamilton Super-Sensitive Drilling Machines and the Hamilton Super-Sensitive Tapping Machine are the finest machines made for the work of producing small holes of plus-precision in materials as diverse as paper and monel or ceramic and bronze. And this belief is fostered by present users through letters of praise. An indication of present users' esteem is this; that eighty percent of our present sales are made to previous users.

The data published here is only intended to show sizes and prices. For a complete description of features and advantages, write for free descriptive literature.

NOTE: All prices are domestic, F.O.B. Hamilton, Ohio, and are subject to change without notice.

DON'T FORGET! WRITE FOR FURTHER INFORMATION!

THE Hamilton TOOL COMPANY

830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A.

by a long shot—if anything it's a mark of strength. Obviously if the boss goes up to one of his men and says, rather apologetically, "Pardon me, Joe, I hate to take your time, but you will bore this casting out to 3 in. for me?" the man is going to recoil with the thought, "Now isn't that a hell of a way to give a man orders!" Then again, to be approached like this: "Hey you, bore this out to 3 in. and be quick about it," would naturally result in a few unkind words and the eventual drama of a noisily packed tool box.

The hard-boiled days are over and consideration for the feelings of one's fellow men has succeeded it. Oh, there will be times during slack periods when the fellow has the advantage and will revert to out-moded practice but these will be few. Be firm, boss, but season that firmness with the salt of kindness. Then, if the worker won't partake thereof as he should, just forget for the moment that you are a gentleman and kick him the hell out of the shop. Let him learn to appreciate values in a well regulated executive.

Incidentally, Ed, who told you that Gentlemen Jim did any flattening to my old freckled-faced friend from down under? If my memory is correct it was old Bob who wielded the thirty-pound sledge and flattened the other fellow.

J. Homewood
Ontario, Calif.

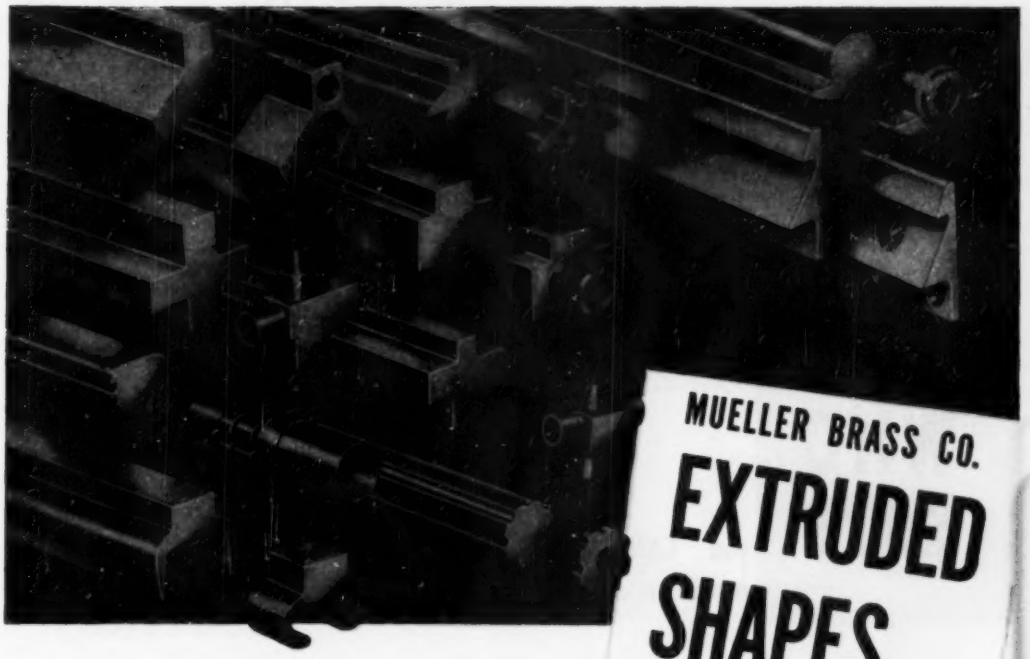
•

Just what is courtesy and where does it stop?

If a man is in the water over his head and is yelling for help do you insist that he say "Please" before you help him out? And if you do help him out is it discourteous to fade out of the picture before he can thank you or the reporters can get your name and "Mug you"?

If a boss comes into the shop before starting time (I know some bosses don't) is it discourteous to say, "Hi gang" or "hello fellows" instead of shaking hands with everyone you see. And if you DO shake hands should that little fellow in the wash room feel hurt because you missed him? He may fancy that you slighted him.

If a rush job comes in and the boss goes to one of the men and says, "Hey, Bill, drop that job and get onto this one. They're broken down over there and need it in a hurry. Stay with it until you get it done." You can bet that there will be more cooperation than if the boss said, "——— come here Bill and get onto this ——————— job and if



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can lower your production costs!

REDUCE MACHINING OPERATIONS—LESS WASTE—The extruded shape is similar to the shape of the finished product, in some instances merely requiring a milling and drilling operation to complete the finished article.

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Do you want more efficient production or better performance of your product? A specially processed rod may be the answer. If you have a problem, please tell us about it, our Technical Engineers and Laboratory are at your disposal.

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Mueller Brass Co. Red Tip Brass Rod is a universal, many-purpose, extra-fast cutting Rod. Its constant uniformity saves tools, grinding and "down" time. It actually can be machined at greater speeds than that of which any machine is capable on a continuous production basis. YOU CAN PIN MORE PROFIT TO YOUR COST SHEET BY USING MUELLER BRASS CO. BRASS ROD AND EXTRUDED SHAPES.

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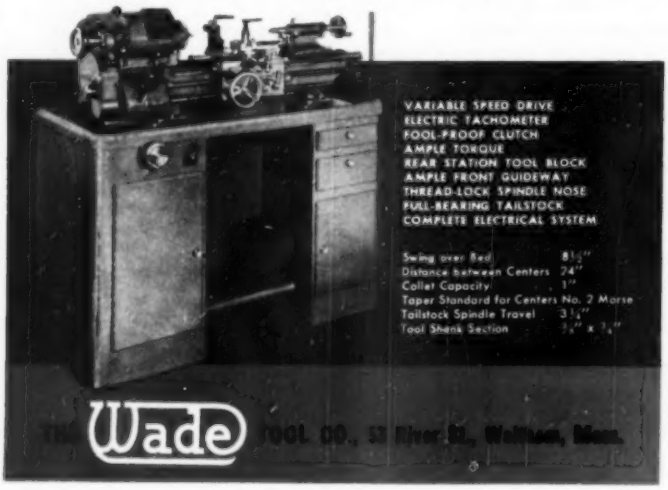
Actually, it's a lathe you **can't afford to be without!** A glance at the list below will show you that the Wade No. 8A has several features you would never expect to find on a lathe of this size — enabling you to perform certain operations usually requiring larger equipment.

The No. 8A is an extremely versatile lathe, carefully designed and ruggedly built for many years of precision work. So, if you're interested in *cutting costs* and *increasing production* you need this modern tool.

Send for the "8A Bulletin" and learn how these new features will give you the UPPER HAND on PRODUCTION!



Wade TOOL CO., 53 River St., Waltham, Mass.

you don't get it out about three hours before I come after it you had better start packing your ——— tools right now."

You can bet your bottom dollar that there will be less soldiering on the job where the men know that they are considered men and not slaves. There is less turnover in that shop also.

I worked for one man some years ago who, when it was necessary, could give a man a quiet talking to that would go in any parlor and in any company, and this without raising his voice. If a pal asked the victim what was said the answer probably would be, "He made me out a ——— ——— ——— and he was right."

Ed says, "There's no point in coddling the boys. If you're civil to some of those guys they will walk all over you." There is the time to show them that courtesy and sternness CAN go together. Sometimes you have to use stern measures to make some of the bright young ones toe the line; but they can show a "hard boiled" boss a thing or two when it comes to toughness.

I knew a traffic cop in another town who could keep traffic going and smile. He knew what "Please" meant and he used it. He never heard the auto horns when he was helping an old lady across the street. One day two young bloods got into a heated argument on his corner and disregarded his admonition to stop or move on. They eventually got to the point where they started to throw their fists at each other. The cop just walked over to them and taking them by the collars bumped their heads together and then dropped them to the pavement. He then went back to directing traffic and paid them no more attention. The toughs got up and took their headaches elsewhere. He proved that he could be tough as well as polite.

A boss can be as polite as Emily Post and get the work out. To be a Simon Legree and beat a man up just to show who is boss went out long ago except in Russia. You cannot make a man like you by beating or cussing him every time you have occasion to speak to him. He will either be a mouse and cringe everytime that he sees you or else he will wait until he meets you in a back alley. Either condition does not help production.

A boss who thinks he has to throw his weight around is either a sham or a coward and the men know it and production is sure to suffer. They are sure to take advantage of it. If the boss is polite and treats the men

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Bending, Forming, Straightening...

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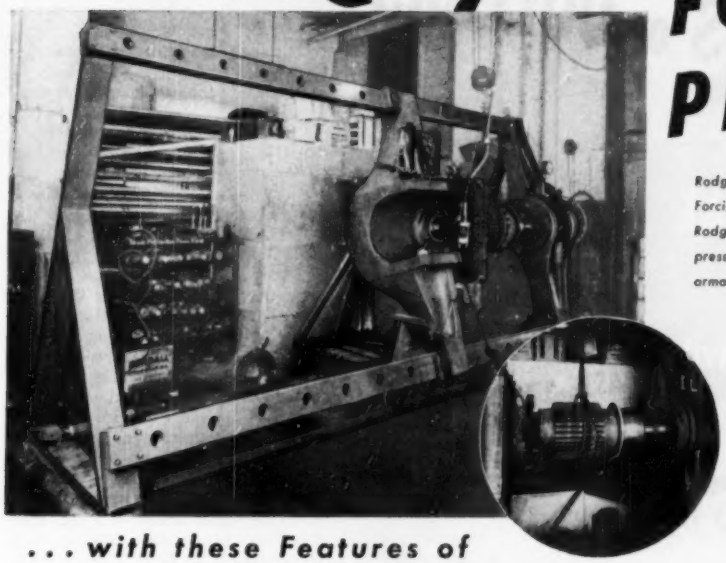

Rodgers 300 Ton, 75° Inclined, Stationary Forcing Press, one of many in the complete Rodgers line. In the application shown, the press is being used efficiently to press an armature shaft.

. . . Separate Power Pump

Select your press operating unit from hand-driven pumps or power-driven pumps. Shown is a Rodgers 2-cylinder Power Pump with remote control.

. . . with these Features of Construction and Operation

- **SEPARATE PUMPING UNITS**—Choose from individual hand-operated or power-driven pumps to operate any model Rodgers Forcing Press.
- **REMOTE CONTROL OF POWER PUMPS**—Operator can control press from any desired position.
- **REMOVABLE HYDRAULIC CYLINDER**—Cylinder is easily removed from head member to permit servicing or use for other power applications.
- **INDIVIDUAL FRAME UNITS**—Tracks, tension bars, abutment member and head member are all separate units to facilitate handling and erection of press.
- **EXPERTLY ENGINEERED AND CONSTRUCTED**—All units of Rodgers Forcing Presses are made strong, durable and dependable to give years of reliable service.

. . . In these Types and Sizes

Rodgers Versatile Forcing Presses are available in portable or stationary models—horizontal, vertical, 75° or 90° inclined—100 to 600 tons—with hand-operated or power-driven pumps. In this broad selection, you'll find the ideal press to meet your requirements.

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For full details and specifications on the complete line of Rodgers Forcing Presses send for Catalog 315.

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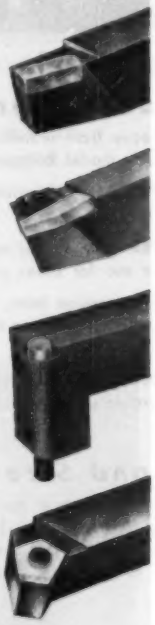

KENNAMETAL Inc.
LATROBE, PA., U.S.A.
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AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY

fairly but is ready to give them a proper call down when necessary they will stay in line. They will not have to be made to toe the line; which is different. Then production and morals will take care of themselves.

Chas. O. Rankin
Ontario, Calif.

•

To paraphrase Shakespeare, "The practice of courtesy in the shop works both ways and is twice blessed; it blesseth him that gives and him that receives."

Courtesy in the shop can be as satisfying as an income-tax refund.

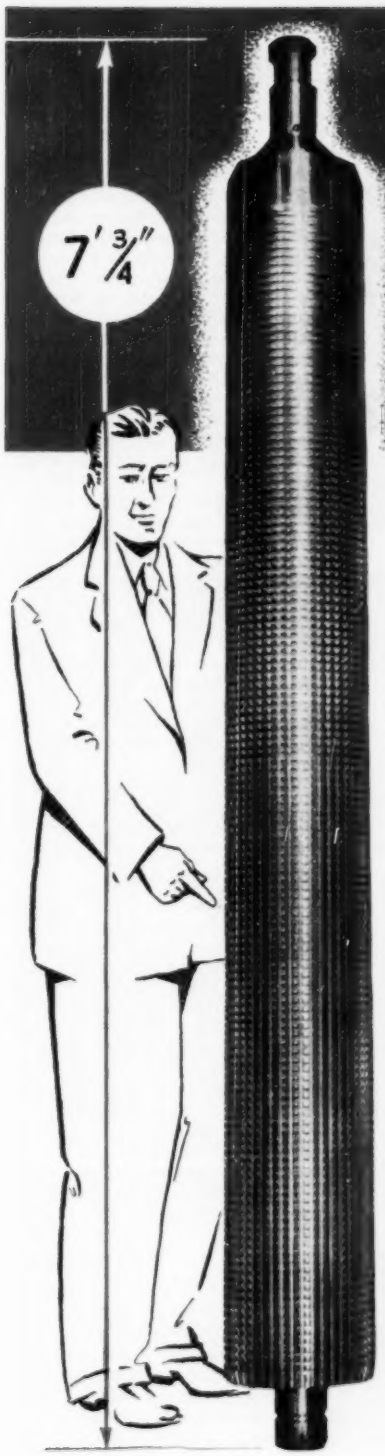
However, the old-line foremen will assure you that all this business of using courtesy, praise, and diplomacy on subordinates is dangerous nonsense. Give a man a pat on the back and show him courtesy, they say, and he will hit you for a raise the next day. Actually, it does not work out that way. Employees in modern industry are realistic. They understand that the boss is bound by budgets and set pay schedules and will do the best he reasonably can for them.

In my meetings with foremen, I frequently hear the objection raised that if you start coddling an employee by treating him nice and courteous, he will walk all over you. That is the old fear of a foreman who is unsure of himself. I reply to it by asking each foreman, "If someone is nice and courteous to you do you respond by walking all over him?" The invariable answer, of course, is, "Well, no."

The immaturity of foremen is showing up in high absenteeism, high turnover, waste, high accident frequency rates, widespread grousing, and needless grievance cases. Many workers today are working with the brakes on simply because they have second-rate foremen. The foreman who is accustomed to giving orders with no back talk, who is oblivious to courtesy in the shop, who makes decisions abruptly without consulting anybody, and snorting fire whenever anything goes wrong, may be a prime cause of lagging production.

Good bossing stems from the top. The foreman who is civil to the men, invites critical suggestions from the workers, and gives subordinates more credit whenever they do good jobs will create a new atmosphere of cheerful friendliness throughout the plant. This reasonable attitude on the part of the foreman will do much to reduce turnover of skilled employees and the unit cost of making the product.

A gang boss at a railroad yard was



1/2 TON INVOLUTE SPLINE BROACH

produced by

DETROIT BROACH

Cutting section of this broach is made from the largest High Speed Steel forging ever produced.

This giant broach was designed and built by Detroit Broach Company to produce the 44-tooth involute spline in ring gears for truck rear axles. Measuring 84¾" long and 9 1/16" O.D.—used on a standard fifty-ton horizontal broaching machine with a 72" stroke—it removes 2¼ lbs. of metal on each stroke. The axle manufacturer now reports that cutting time on this operation was cut from 44.8 minutes to 0.7 of a minute with this broach (a reduction of 98.4%). In addition, handling is reduced since it previously required 2 operations to complete the teeth whereas broaching does it in one operation. The original cost of the broach tooling is only ⅓ that of the previous method, and tool sharpening costs are reduced 12 times.

Specializing in the design and manufacture of broaches and broach tooling exclusively, Detroit Broach is thoroughly qualified to analyze *your* splined parts and then create tools that will economically produce them to required tolerances. Call in your local Detroit Broach representative or write for one of our application engineers to call. He will gladly study your jobs and give you broaching cost and production data on them. You're sure to find that it's one way to cut today's manufacturing costs.

DETROIT *Broach* COMPANY

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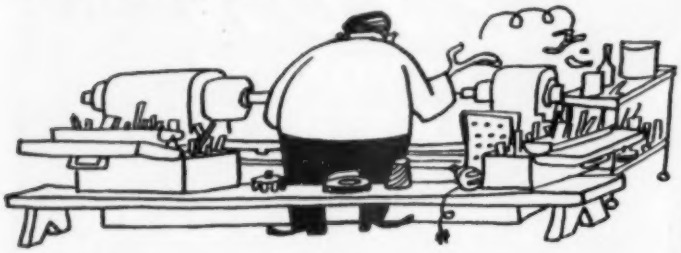
BOOTH 505 — A.S.T.E. SHOW
Philadelphia — April 10-14

Nine plants out of ten can cut their tool purchases by reducing tool crib inventories. This is not an exaggeration, so . . .



. . . Why Buy Tools You Don't Need?

Many employees, for example, accumulate tools enough for a private tool crib. Their benches, boxes and machines are lined with tools that should be in the crib ready for use.

It's a fact, too, that most tool cribs are overstocked from 25% to 40%. The tool supervisor or the crib attendant must keep enough on hand to play safe, but it runs up expense. Equip him with McCaskey Tool Crib Control and your purchases will drop at once. Here is proof from users' reports:

. . . "Four inventory cuts in two years, total of $9,000 in one crib."

. . . "Inventory reduced 39%."

. . . "Know definitely number of tools required. Inventory down 50%."

. . . "Equipment (McCaskey) paid for many times over by reducing requirements to minimum."

Our new booklet, "How Tool Costs Were Cut 12 Ways in 20 Plants" suggests how similar savings can be made a dozen ways in your plant and proves it with factual reports from responsible plant executives.

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accustomed to throwing his power around. One cold day he told a workman to pick up some heavy couplers (with his bare hands) and move them. The workman objected and didn't bother to explain that he had to get gloves. With that, the boss hollered, "Are you going to do what I told you, or not?"

The workman, thus challenged, retorted, "I'm not." Meanwhile, the rest of his fellows had gathered around. The boss was up a tree. He had put himself up. Since he felt his face was involved, he fired the man—and all the rest of the crew walked out in protest. It took several months for the management to patch up the incident, which would never have started if the boss had said sympathetically in asking the man to move the couplers, "I know it's a cold day, but we've got to get it done."

A good illustration of the relative efficiency of the tough driving foreman and the courteous leading type may be found in the analogous story of the balky calf. It seems the calf refused to go through the barn door. The farmer cursed it and flogged it. He put his shoulder to the calf's rump and heaved, but gained only a few inches. At that point the milkmaid walked up, put one finger in the calf's mouth, turned, and walked into the barn, with the calf following contentedly.

That's the kind of results you can get from people when you treat them reasonably and courteously in leading them instead of driving them, and when you start thinking in terms of what they want, instead of just what you want.

American workers by nature are fair and, when they rub shoulders with someone and that someone is a square guy, they like him. Being human and practicing courtesy in the shop are not exercised in paternalism or philanthropy on the foreman's part. The human approach by foreman is also the approach which results in maximum production.

Courtesy not only has a place in the shop but in all our human relations. As Emerson once said, "Life is not so short but that there is always time enough for courtesy."

Harry Kaufman
Philadelphia, Pa

•

BROTHER'S KEEPER

In a previous article, I have stated that it is none of an employer's business if an employee drank a little, didn't go to church, took no part in community affairs, gambled a bit

NEW B&D 7" Junior Sander ($53.00) specially designed for intermittent service. Universal motor in line with spindle and "right angle" handles give it perfect operating control, better balance, greater compactness. Other B&D Sanders for heavier duty include 7" Standard ($67.00), 7" Heavy-Duty ($76.00) and 9" Heavy-Duty ($92.00).

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Black & Decker Sanders are the most versatile electric tools you can buy to save time and money in your plant!

With abrasive discs, they handle all sanding, from fast metal removal to satin-smooth finishing. ***With saucer grinding wheels,*** they smooth welds and casting ridges; cut off old studs, bolts and rivets. ***With "Whirlwind" wire cup brushes,*** they remove paint, rust, scale; clean castings, tanks, vats, boilers, sheet metal and soldered joints. ***With rotary gouging and planing heads,*** they shape and semi-finish lumber; remove stencil and brand marks from barrels and boxes.

See your nearby B&D Distributor for full details on their powerful B&D-built universal motors, husky construction, easy handling. Write for free catalog to: THE BLACK & DECKER MFG. CO., 616 Pennsylvania Ave., Towson 4, Md.

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Rotate the sheet forming one corner at a time . . . overall specified dimensions are held . . .

For medium production schedules you draw one corner at a time . . . eliminate costly draw dies . . . eliminate costly notching, hand welding, and finishing . . . Use simple corner punch and die for all sizes with the same corner radius . . . switch in a few minutes to a similar die for a corner of different radius.

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We will gladly forward additional information if your request includes your present panel part prints for our immediate proposal or recommendation. This will cover the Vulcan-draw, the corner dies, and all needed brake press, corner trim, and return flange dies to make fully finished panels at reduced cost. Present Vulcan-draw deliveries approximately 16 weeks.

VULCAN TOOL CO., Highland Ave., Dayton, O.

and so forth, but this is a horse of a different color. This Matson does his chiseling in the shop. His mates do him a good turn, lending money and their own tools to help him out and he doesn't have the slightest intention of repaying the loan and finally leaves them holding the bag.

That is petty larceny and nothing else, and I believe it's the foreman's job to see that the lenders are repaid and tools returned or made good.

Matson did this petty chiseling and borrowing while he was working and earning good money and could have bought tools he required the same as anyone else. Also there should not have been the necessity of borrowing $5 or so from anyone. How would he get along if he got out of a job altogether when he borrowed and chiseled when he is making good wages?

In almost any plant, if a man has a good reputation and, through circumstances beyond his control, such as hospital or heavy doctor bills, he needs extra money, he can get a loan from the company without anyone else but he and the company being the wiser and repay almost to suit himself.

However, I don't believe that Matson should be refused employment due to his chiseling and borrowing habits and failing to repay. But I would, if in Ed's position, make it a condition of again employing him that full repayment of money and tools should definitely be made to the lenders by the method of deducting it from his wages and returning it to the lenders, within a month. In other words spreading repayments over the first month.

I would give Matson a job because he is just like you and I. He has to eat, pay rent, taxes, he is human same as us with his share of human weaknesses. To refuse to employ him might lead him to other bad habits. I would rather try to help him get rid of this fault of chiseling from his fellow workmen.

Finally Ed wants to know if he is his Brother's Keeper. We all should be, and lots of people do try their level best to help their sisters and brothers to lead a better life, lending a hand when they are in trouble. If Ed can get Matson to change his habits of chiseling from his mates and become a respected fellow worker, if he achieves that he will have helped Matson and it will have been well worth while and it certainly will give Ed a great feeling of satisfaction to have done so. I would much prefer to have a man in the shop who, although only an average workman as far as ability goes but

WHAT MAKES UP A Good Air Circuit?

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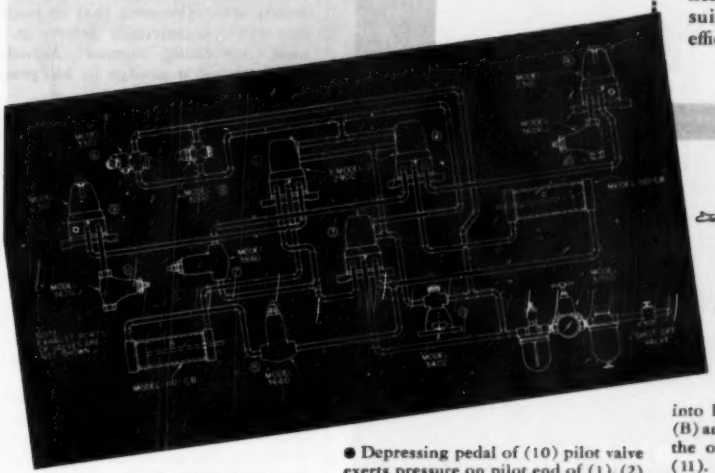
Equally important is the know-how as demonstrated by Gerotor Factory and Distributor Representatives. These men possess the knowledge and experience to help you draw up the most suitable circuit to furnish efficient and lasting service.



AIR EQUIPMENT ON AN AUTOMATIC LATHE FOR CLAMP, TURNING AND CUT-OFF

Get Gerotor Catalog Sections No. 54 and No. 302
describing air valves and cylinders
Write to
RIVETT LATHE & GRINDER Inc.
Dept. AM-4, Brighton 35, Boston, Mass.

● Depressing pedal of (10) pilot valve exerts pressure on pilot end of (1), (2) and (3) pilot operated 4-way valves. Air flows from valve (3) to blind end of clamp cylinder (A). Piston moves out rapidly, the air from rod end being exhausted thru (4) cam operated 4-way valve. When clamp cylinder rod (A) depresses cam of valve (4), exhaust air from cylinder is restricted (12), providing for a slow approach. When clamp cylinder engages work, pressure in supply line increases, causing sequence valve (5) to open. Air flows into blind end of cut-off tool cylinder (B) and a similar action takes place thru the out-stroke, by means of (9) and (11). After the cut-off, cylinder rod depresses cam of (6) pilot valve which, by pilot pressure, reverses valves (1), (2), and (3). Air line is then connected to the rod end of cylinder (B) and retracts cut-off tool. After cylinder completes return stroke, pressure builds up in supply line connected to sequence valve (7). Pressure opens valve (7) and allows air to rod end of clamp cylinder. After it retracts, cycle is completed. Pilot valve (8) permits interruption of cycle to retract cylinders.

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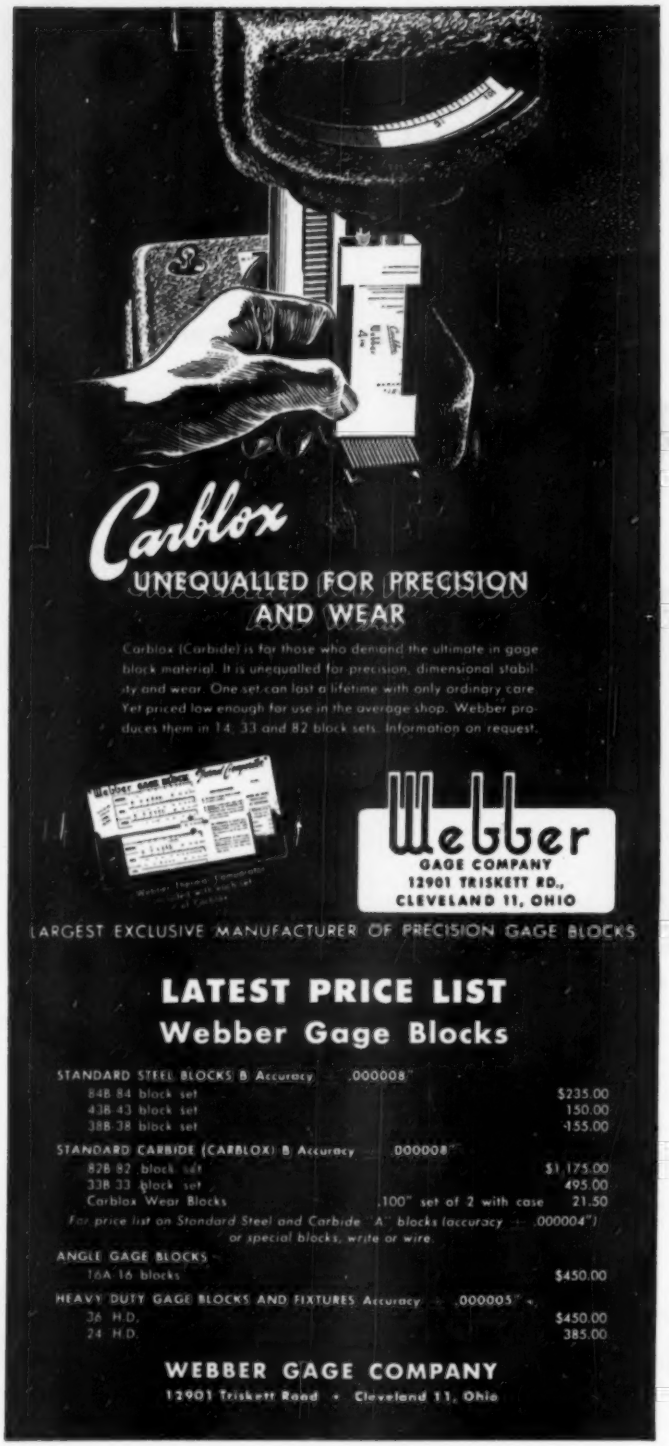
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For price list on Standard Steel and Carbide "A" blocks (accuracy .00004") or special blocks, write or wire.
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WEBBER GAGE COMPANY
12901 Triskett Road • Cleveland 11, Ohio

who earned the respect of his fellow by his sterling character, than a crackerjack workman who also had the reputation of being a cheap petty chiseler such as crackerjack Matson appears to be.

Arthur Silvester
Niantic, Conn.

•

No one is perfect, and if an individual has ability along a certain line high enough more than to offset his faults he should be retained.

We all are influenced by the conduct of those with whom we associate, therefore we are our brother's keeper and each of those with whom we associate must carry the same responsibility.

In one place where I worked there was a young man—a fellow mechanic—who while just an average mechanic, had the ability of amusing and entertaining those who were within hearing and sight of him by his occasional outbursts of a few words, actions or song that he could and would occasionally deliver in a most interesting manner. Nobody could harbor a grudge in his presence.

He was a leaven in the group in which he worked, and I am sure was of value to the company for which we worked far beyond the value of the work which he actually did.

At another place where I was working a friend of mine who was working for the same firm but in another department some distance from me came in one day all out of breath during working hours, to tell me that he had heard a man had come to work in the shop where I was by the name, we will say Jack, whom my friend knew as the worst deadbeat that he ever knew. He came to tell me and all the rest in the shop that this man, Jack, was wont to borrow anything from a nickel up, or tools as well, and very seldom returned anything except he thought that by doing so it might give him an opening to borrow something of greater value. This man Jack had ability and generally had work, although he went from one shop to another very frequently. He was a problem.

A new employer generally decided before this Jack had worked very long that he did not have enough to his credit to warrant keeping him permanently.

I have known men who were excellent workmen who could not work in a gang or with any other individual but could and did make an excellent showing when given a job that required no contact with others,

New Behr-Manning belt methods

Cut contour polishing costs

Now you can polish contours with *fewer operations* and *without wheel marks*. And you can do an easier, superior buffing job after polishing — *no wild grain marks* to eat up production costs, labor and equipment time.

This new way of contour polishing has been developed by Behr-Manning application engineers, utilizing fast-finishing, cool-cutting flexible abrasive belts and special contact wheels.

See this method demonstrated in your own plant on your own work. Take this first step to gain an immediate production advantage on contour polishing operations.

BEHR-MANNING
TROY, N.Y.

Use NORTON® abrasives sharpening stones

AM-4-50

BEHR-MANNING, Troy, New York

I'd like to see a free demonstration of the new Behr-Manning contour polishing method.

NAME ..... TITLE .....

COMPANY .....

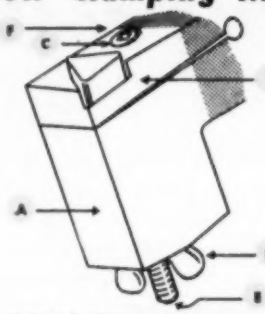
STREET ..... COUNTY .....

CITY ..... ZONE ..... STATE .....

NEW *Chrome Plated* HOLDERS
-UP TO 500% MORE LIFE

IMPROVED *Ejector Tool* DESIGNS

New Clamping Method — Lower Prices



A. Hard chrome plate gives up to 500% longer wear by eliminating chip erosion.

B. New clamping device gives controlled locking and stress-free carbide insert support.

C. Easily accessible clamp locking screw for fast and easy blade interchange.

D. Wing nut locks adjusting screw. No wrench required.

E. Knock-out hole for easy carbide insert removal.

F. No offsets nor excessive overhangs. Permits adjacent set-up of holders.

Visit our booth at the A.S.T.E. show.

Selected alloy steel, heat treated, and hard chrome plated, combined with quality SUPER workmanship gives you a holder that resists distortion and scoring. The broached holes fully enclose and support the carbide inserts.

No separate parts or clamping devices to become lost or to cause other complications.

WRITE FOR THE NEW SUPER CATALOG

SUPER TOOL COMPANY
21650 HOOVER ROAD
DETROIT 13, MICHIGAN

thus placing them on the asset side.

It often takes some time to get employees rightly placed where they can work to best advantage for all concerned, but it pays to go into such matters very carefully and thoroughly.

Every reasonable effort should be made to place employees where they best fit. Following this they must be judged by their actual assets and liabilities.

Abel Blakeman
Watervliet, N. Y.

TO THE EDITOR

Was Godfrey Pulling Somebody's Leg?

MANY old-timers will understand why Mr. Godfrey expressed himself as he did. Thousands of workers were tolerated in the last war because of the dearth of first-class mechanics. And those who gained some knowledge had the effrontery to crash employment gates after the shooting war in the guise of toolmakers. It may be that the complaining small-shop boss mentioned by John R. had his share of these newborn "on-the-moneyers." And because Mr. Godfrey brought the situation to light he was pounced upon by readers. Go easy on him, Mr. Up-to-dater; he was only drawing you out.

Yet, I'm one of those old-timers who likes to reflect upon the good old days. Let me give you an example of the style with which drill-jigs were turned out in the stockyard district of Chicago in the first decade of this century.

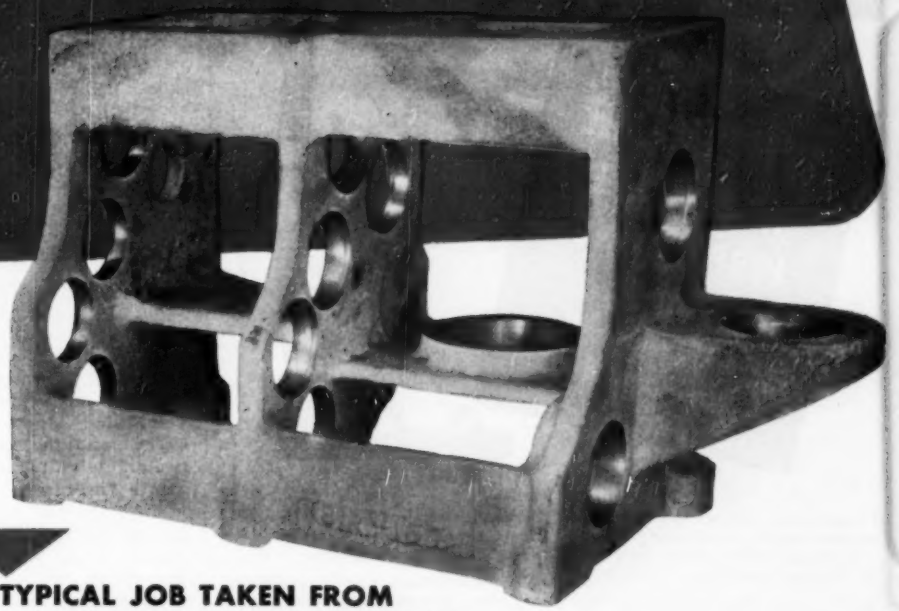
We had no such luxuries as jig borers. All we had was a drillpress, of which the table was luckily square with the spindle. After laying out hole locations on the jig plate and prick-punching them with the aid of a magnifying glass, we drilled a small hole first, then followed with a larger one. By inserting slightly tapered plugs we measured center distance. If a correction was necessary (nearly always) the hole was scraped over and reamed out. Repeated trials finally brought the obstinate hole within the astounding limits of one-thousandth of an inch!

It is possible the old-timer would be no more outstanding than his modern successor, except for patience, if they could work side by side. But he certainly had to be ingenious. I was 21 when I entered that chicken-wire-inclosed toolroom. The first

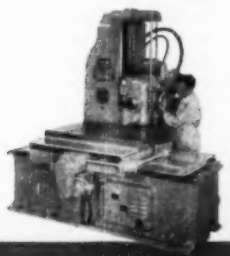
THE "JIGMIL TECHNIQUE"

OBSOLETES JIGS

for Precision Boring Operations on Small Lot Production



TYPICAL JOB TAKEN FROM OUR JIGMIL CASE HISTORY FILE



PART • Cast-Iron Gearbox.
OPERATION • Bore and Counterbore 13 Holes Ranging from 1.8535" to 2.8335". Face Two 3½" Diameter Bosses.

FLOOR TO FLOOR TIME • 75 Minutes.
TOLERANCE ON HOLE SPACING • .0005".
TOLERANCE ON BORE DIAMETERS • .0004".

Come to Detroit—

and investigate the Jigmil Technique. Demonstrations at our Plant by appointment.

DEVLIEG MACHINE CO. 450 FAIR AVE. FERNDALE 20 (DETROIT), MICH.

DEVLIEG JIGMIL

Meet sudden change-orders without tying up Press Production

WHISTLER
ADJUSTABLE PERFORATING DIES
quickly and easily rearranged

Change-orders from the engineering department usually cause plenty of headaches in production...particularly where die piercing operations are involved.

But, if you're using Whistler Adjustable Dies, there is no lost time—no waiting—no extra die expense. The same dies are easy to rearrange to the new design. Add units from stock, or delete sizes and shapes no longer required. Arrange the new set-up right on the press.

Consider the savings in production time alone. Then think how continued re-use of the same dies in subsequent jobs writes off first cost.

Whistler Dies can be used in practically any press. All parts are interchangeable. Precision is assured on long or short runs. Closer centers permit fewer press operations.

Deliveries are quick... little or no waiting. Standard round punches and dies up to 3" are available from stock. Ovals, squares, rectangles and special shapes made up in a few days.

WRITE for the Whistler Catalog today and get all the facts!

S. B. WHISTLER & SONS, INC.

758 MILITARY ROAD • BUFFALO 17, NEW YORK

First public showing of Whistler Magnetic Dies at work—Booth 832—A.S.T.E.-Convention—April 10-14—Philadelphia.

man I saw was a 50-year-old, cutting a thread for an 8-32 tap, using a 12-in. Hendey lathe. I bring these things to light to emphasize the necessary versatility of the old-timer, so that it may be weighed against the many facilities the modern workman has at his disposal. It is modern equipment that cuts hours and increases work quality.

We have nothing to be ashamed of in the modern toolmaker. With the educational facilities we have, the groundwork evolved throughout the past 50 years, and all sorts of modern equipment, we can turn out a pretty good workman in a short space of time. But let us not belittle the old-timer, for at the pace we are going the modern toolmaker may soon become as out of date as a Model T.

A man of Mr. Godfrey's experience knows this, but he probably wanted to give the younger fellows a chance to sound off. And when the yelling dies down, maybe some of the younger men will realize that they don't know it all and will be surpassed by the men of the future.

John Homewood

•

When Metalworking Turned the Corner—Discussion

Jan. 9 *A.M.* was particularly interesting to an old-time machinist, beginning with the cover. Here is the old cast-iron water pot which dripped oil or water, usually the latter, in stingy drops which did very little good as a coolant.

The man at the right was of particular interest to me as I have not seen a Fox turret lathe in many years. They used to be very common in brassworking shops. In our shop, however, we never fed both the chasing tool and the turret at the same time, as this would have meant disaster. The left hand held the "Fox," or thread-chasing attachment, firmly on the front way of the lathe while the right hand fed the thread-chasing tool into the work. It was also necessary to lift the chasing attachment out of contact with the hob or leader, which fed the tool at the desired pitch. Each thread had its own hob or leader. Most threads were short and frequently ran into a small recess next to a shoulder on the work. As I recall, our Fox turret cost a bit under $300.

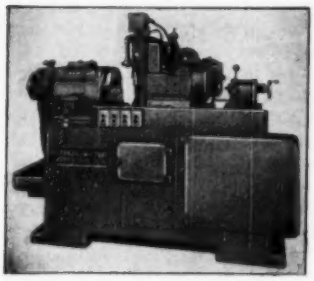
The old Blickensderfer typewriter was one of several of the corn-

(advertisement)

Hanson-Whitney Thread Grinder features Easier . . . Faster . . . More Wheel Dressings

Hanson-Whitney extends an invitation to you to *see* its new semi-automatic Thread Grinder at work. It is impossible, in restricted space, to explain the importance of this engineering achievement . . . to provide the necessary close-up photographs that bring out the many design innovations . . . nor can we show you the accuracy, the speed, the quality of production.

But we *can* arrange an appointment that we believe will interest anyone who needs a



STREAMLINED, COMPACT HANSON-WHITNEY THREAD GRINDER

better, faster method for grinding external threads from the solid on a production basis.

You will see a Master Roll that re-trues the Grinding Wheel for re-grinding the Crusher Roll in position, whenever its pattern has been worn by repeated crushing of the wheel. This means uninterrupted production for a long time . . . until the original Master Roll thread pattern itself becomes worn.

This is but one valuable feature of the new Thread Grinder. There are many more which combine to step up machine performance, lower operator fatigue, reduce rejects, and greatly improve the work.

If you are interested in rapid production thread grinding, we ask you to write us.

It seems to be a foregone conclusion in many plants that taps in the screw machine sizes are *expected* to break . . . and *expected* to wear out . . . quickly.

Well, there's a big difference in taps and also in the meaning of "quickly."

Here at Hanson-Whitney we know that taps are expendable to a degree . . . but the degree depends upon many factors such as tap selection, type of operation, work material and lubrication.

If you are having troubles with tap breakage and tap wear we suggest that you do two things, 1) Write for our engineering suggestions, 2) Specify Hanson-Whitney taps . . . finished after hardening. There are no finer taps made.

HANSON-WHITNEY MACHINE CO. HARTFORD 2, CONN.
Division of Whitney-Hanson Industries, Inc.

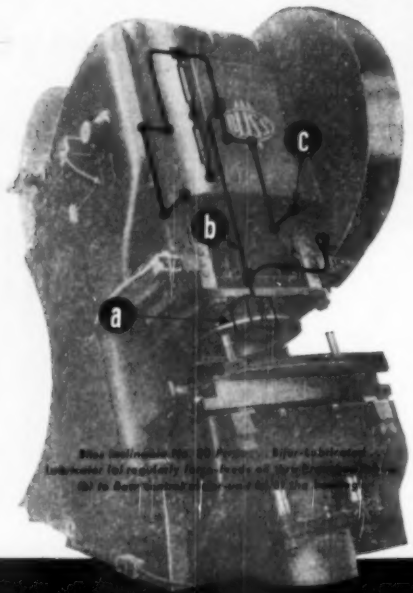
For practical recommendations submit your problems to Hanson-Whitney engineers.

Hanson Whitney

PIONEERS OF FINISHED TAPS

LEADING MANUFACTURERS STANDARDIZE ON THE BIJUR SYSTEM

reduce bearing wear



by controlling oil film at the bearings

Oil film at the bearings keeps the metallic surfaces apart, reducing wear to a minimum. This oil film must be maintained *constantly* to be effective.

Lubrication by hit and miss methods can't be depended upon to keep bearings running smoothly. Proper lubrication requires a system which force-feeds the correct amount of oil to all bearings and carefully controls the oil flow at each individual bearing *automatically*.

This is accomplished by Bijur, the system with positive Meter-Unit control of oil flow *at the bearings*. For further details write for "The A B C of Modern Lubrication."

387

BIJUR
LUBRICATING CORPORATION
LONG ISLAND CITY 1, NEW YORK

cob type. The Crabdall came nearer to deserving the name, as it had a longer type cylinder of smaller diameter. It was rather fascinating to see the type roll turn and raise itself to the right level to print the letter you wanted. The letters were the kernels on the corncob.

The advertisement for the "General machinist, preferably married and with a family, at $2.50 per day" hit home. That was my pay when I was married, but the family was lacking for the time being. Of course the man with the family was, and is, more likely to stay put.

Piecework was an old story at that time, however, even without an expert to introduce the system. It dates back before 1883 when I entered the shop as an apprentice. The main piecework "system" of the day seemed to be to set the piecework rate so that a fairly fast man could earn a little more than by day work. If he exceeded it by more than the boss thought he should, the rates were cut. Men soon learned not to turn in an extra-good day's work but to hide the surplus under the bench to be fed into the line when castings ran bad or tools broke. Although Fred Taylor was most unpopular in introducing his scientific management, he deserves credit for trying to prevent this rate cutting by dividing the saving between the men and the company. It is probable that Fred Halsey's system was a bit ahead of Taylor's, but the latter received the most publicity—and attracted the most antagonism.

Blueprinting did not date back before 1885 in our shop. As late as 1893 we coated our own blueprint paper and made prints when the sun shone, as illustrated, except that we had a single track running out of the drawing-room window over a flat roof. We did have a toolroom, however, before 1900. It was not large nor well equipped but we kept taps, dies, boring bars and cutters on inclined shelves where they could be easily seen and kept clean.

I recall Fred Miller's articles from the World's Fair in Paris; it was at the Chicago World's Fair in 1893 that I first met him. He pointed out much of interest at that time. His articles from both Fairs were very informative, as were all his writings.

A lesson in COST-CUTTING

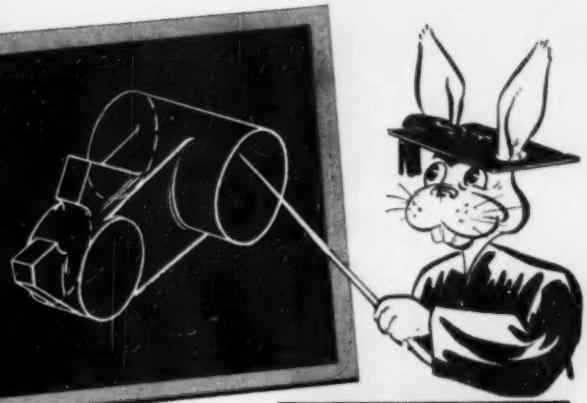
PROBLEM:

How to machine all 6 surfaces on this grey iron casting for a parking brake toggle

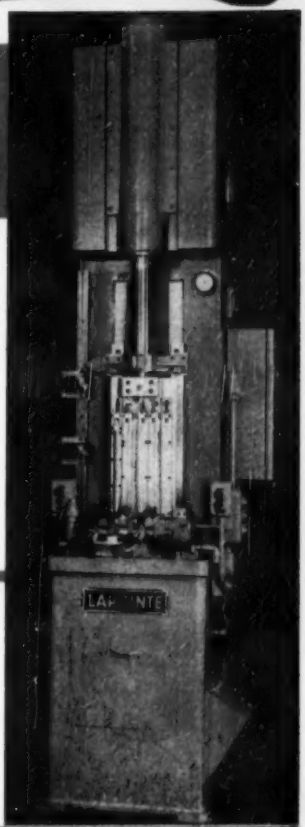
(a) with the utmost speed

(b) with least possible labor cost

(c) with minimum investment in machinery



SOLUTION: LAPOINTE The LOW-COST PRECISION PRESS



which, with one operator, broaches 100 parts per hour at 80% efficiency!

Lapointe Precision Presses are BUILT FOR BROACHING! They have the same inherent accuracy as any machine tool, and should not be confused with so-called utility presses on the market. Provided with *automatic controls*, all electrical interlocks, and — when wanted — a variable speed feature, these presses have a cutting speed up to 25 ft. per minute. They are *amazingly accurate, extremely fast,* and *surprisingly inexpensive.*

TO CUT YOUR MACHINING COSTS and to keep your investment in equipment at the lowest possible point, investigate Lapointe Precision Presses. Our entire series of presses is illustrated in our Bulletin FP-2. Write for it.

Shown here: **10-TON, 24" STROKE PRECISION PRESS FULL-AUTOMATIC CYCLE. SEALED OIL RESERVOIR.**

With hand-fed, hydraulically operated in-and-out table having a 3-position work-holding fixture equipped with simplified cam-actuated work clamps. The in-and-out action of the fixture is accomplished by the hydraulically operated cam, that locks the table in either direction. Fixture is interlocked with ram to prevent operation if table is not in proper position. Dual "Cut" buttons are provided, for the safety of the operator. Table has a micrometer stop, to provide precise setting for cutting operation.

THE *Lapointe* MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

Branch Factory • Edgware • Middlesex • England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

IS THE KEY
TO
CUTTING
COSTS

CALL AN
Allison
ABRASIVE
CUTTING
EXPERT

THE ALLISON COMPANY
357 Island Brook Avenue
Bridgeport 8, Connecticut

Allison
abrasive
CUTTING
WHEELS

TAL-60

The notice of the Potter & Johnston "slow-burning" shop construction reminds me that I knew Jack Johnston while he was still chief draftsman at the Pratt & Whitney Company before the Potter & Johnston Company was born. It is interesting to note that the company was very successful, and has now returned to the Pratt & Whitney Company.

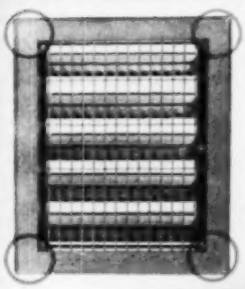
Mention of the old League of American Wheelmen reminds me that I was an early member, my number being 563. I rode a 48-in. Columbia high wheel with hard tires of course, and plain bearings. I mention these because on two occasions they seized and gave men a very forcible header. My wife still has my old L.A.W. pin.

The steam-driven vehicle made for the Adams Express Co., designed by Arthur Herschman, recalls my correspondence with him before he came to this country, something over 50 years ago. I had the pleasure of riding in his express wagon in Cincinnati when it was exhibited to the ASME meeting.

Hydraulic - operated machines have been tried a number of times. James Hartness secured extensive and comprehensive patents for a hydraulic turret lathe and a few were built. I saw one of them in the old shop. Dan Wright, of Henry & Wright of Hartford, had an ambitious scheme of putting hydraulic motors on each machine in the shop. Oil was to be pumped to each machine from a central source with the piping under the shop floor and outlets at each machine.

In a somewhat similar way, Frank Wells had a plan for putting all the shafting and countershafts under the floor and belting up to each machine. I'm not sure whether he ever actually tried this out or not. I am under the impression that Harry Harris, now of Bridgeport, told me of this scheme when he was superintendent of the Wells plant in Greenfield.

The first all-motor-driven shop that I saw was the Bullock Electric Company plant in Norwood, now part of Cincinnati. (Bullock is now part of Allis-Chalmers.) This shop had the additional novelty of having every machine decorated with a coat of aluminum paint. It was very striking and seemed more feasible than the trend at the time for painting machine tools white. The Pittsburgh Locomotive Company was the first I recall to try white paint. It added immensely to the light in the shop, but it was too much of a chore to keep the machines looking presentable. Oil from the bearings and other sources made them anything but attractive.



THREE-PHASE RESISTANCE WELDING

makes this grill look better . . . last longer . . . cost less . . . by mash-welding mitre corners

Sciaky *completely engineered* welding machines are unsurpassed for dependability, efficiency and economy. Our technical staff is trained to recommend the correct type of resistance welding equipment to improve your products.

Just write to:

SCIAKY BROS., INC.
4915 W. 67th Street
Chicago 38, Illinois

SCIAKY

FROM
25-125
erratic threaded holes
per tap

TO
22,000
clean class 3 threaded
holes per tap

HERE'S HOW
HY-PRO DID IT...

PART: 18-8 stainless steel hex nut with *punched hole*

PROBLEM: Tapping with a 10-24 tap, a leading nut manufacturer experienced difficulty holding size and was troubled with excessive tap breakage.

Then They Called in the HY-PRO Sales Engineer

HY-PRO SOLUTION: His recommendation was a standard Hy-Pro 10-24 machine screw tap with one of the exclusive Hy-Pro surface treatments for wear and lubrication. Speed and cutting oil were adopted from extensive tables in Hy-Pro catalog. Production with Hy-Pro taps now averages 22,000 burr-free *Class 3* threaded holes at 62 nuts per minute.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.

Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

℞ Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

HY-PRO TAPS
HY-PRO TOOL CO.
NEW BEDFORD, MASSACHUSETTS
A SUBSIDIARY OF CONTINENTAL SCREW COMPANY

All through the years there have been outstanding examples of efforts to secure and retain good relations between men and management, as pointed out in this most interesting and comprehensive article. That they have not always succeeded and that we have had disastrous and unnecessary work stoppages makes it imperative that we continue efforts to improve these relations. Perhaps an understanding of each other's problems is one of the best ways to secure the desired results.

Fred H. Colvin

•

Look Ahead—Not Back

WITH ALL the discussion by foremen and other shop supervisors about how to handle the men who work for them—including many Round Table letters—the foremen may be overlooking one of their major problems. It is probably one which few foremen realize exists.

Jealousy and selfishness on the part of a foreman are real problems. Overlooking the chance to become a bigger and better man because of fear that one of his subordinates will catch and overtake him is not unknown in many shops. Even when his men have the good of the company in mind, the foreman does not often want the men to go beyond their realm of operations.

The foreman usually feels that his job is to run the shop and keep it profitable, and he doesn't want any of his authority taken away.

But unless the foreman can securely hold the trust and confidence placed in him by management, there is not much point in having him at all.

With a little more consideration on the part of the foreman, the men will sense that he has their welfare in mind, as well as that of the company. The foreman has no fun in wondering when one of the "young punks" in the shop will do him out of his job, but he often forgets that if he treats the men fairly and considerately, the "young punks" will be his friends and will seek jobs comparable to his when they are able, and will make a point of not trying to take his position.

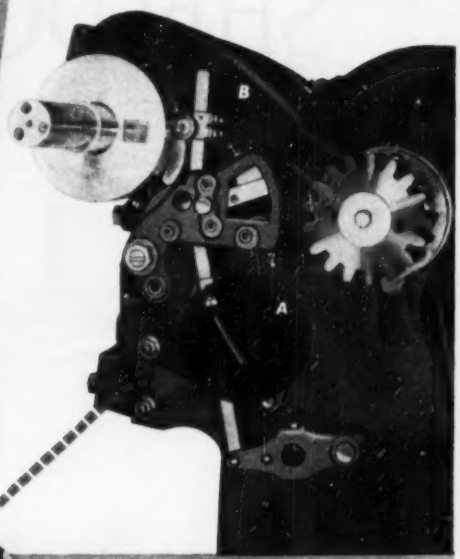
The man who can forget his personal greed once in a while so his workers can realize some of their ambitions is only repaying in kind to the foreman who helped him into his present position.

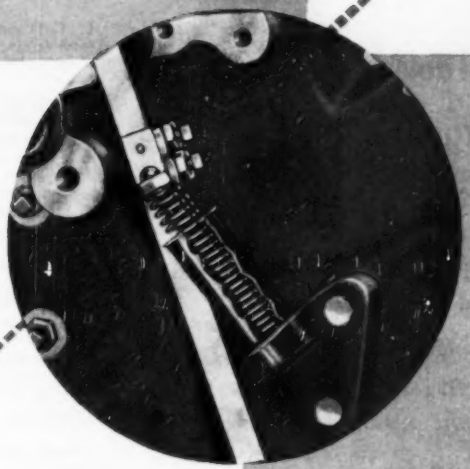
Jack E. Homewood
Bakersfield, Calif.

EXTRA SAFETY

AFFORDED ONLY BY JOHNSON *INCLINABLE* POWER PRESSES

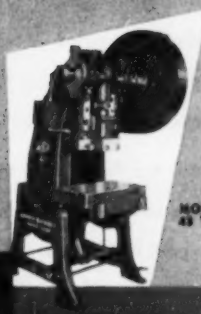
IN your calculation of equipment costs, one of the most important considerations is SAFETY. This factor becomes part of your over-all operating picture, to be considered beyond the direct investment in particular machine units. Johnson builds into all its inclinable power presses, as an integral assembly, a patented Non-Repeating Safety Trip. This device is available on no other make of press, yet costs nothing extra. If you think SAFETY FIRST, you'll think first of JOHNSON.





Uncovered by removing the flywheel, the Johnson Safety Tripping mechanism is pictured above in engaged position, the trip pedal depressed, the activating springs at (A) ready to expand and lift the release lever and roller to upper position, awaiting the next cycle. Note two activating springs. If one fails, the other takes over. Should both break, the clutch automatically disengages. Replacement of springs can be made in 30 seconds, without stopping machine or removing parts other than those to be replaced.

Phantom view of pedal spring guide tube above reveals simplicity of Johnson Safety Trip activation. This mechanism is for single stroke operation. For continuous automatic operation simply raise the release lever roller to (B) position. Any plant doing a variety of jobs needs the adaptability, simplicity, precision and SAFETY of Johnson Inclinable Power Presses.



MODEL No. 4½
45 Ton Capacity

Write for detailed information on seven models of open back inclinables now offered. Chances are a Johnson can do a better job for you.

Johnson MACHINE and PRESS CORP.

SHELDON

3 Small Machine Tools that cover large production areas

Inexpensive to buy, space and power saving, light, fast and easy to operate, these improved SHELDON Machine Tools embody new engineering that gives them *increased capacity for size.** Scientific distribution of mass has given rigidity and stamina without cumbersomeness.

Here is a new development in *profitable production*—a way to obtain more pieces per hour at a lower cost per piece.

* *Increased collet capacity*

* *More power to cutting point*

* *Zero Precision taper roller bearings—more speed, longer life, extreme accuracy*

Write for catalog.

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4234 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

Names in the News

(*Continued from page* 181)

Dean Uhll, western division service manager, Caterpillar Tractor Co., Peoria, Ill., has been named export service manager. The appointment relieves **Ralph G. Dunn,** assistant general service manager, who has served as export service manager in addition to his other administrative duties. **Harrison Welch,** eastern division service manager, succeeds Mr. Uhll as western manager, and **D. L. Lammers** succeeds Mr. Welch as eastern manager.

W. F. Crawford, president, Edward Valves, Inc., East Chicago, Ind., has been elected a director of Central Scientific Co., Chicago.

F. Carl Saacke has been named safety engineer, Air Reduction Co., Inc., New York.

Francis D. McGuire, Jr., Donald E. Shaw, Richard W. Shuman, John W. Matthews, Robert G. Naethans, and **James A. Sudduth** have been named sales representatives in the midwest and central regions, General Machinery Div., Allis-Chalmers, Milwaukee. Mr. McGuire and Mr. Shaw have been assigned to the Chicago office, Mr. Shuman to Indianapolis, Mr. Matthews to Louisville, Mr. Naethans to Cleveland, and Mr. Sudduth to Toledo.

Robert C. Tyson, assistant comptroller, United States Steel Corp., has been elected comptroller of the corporation.

Donald H. Jones has been named general sales manager, Coating and Fibron Divisions, Irvington Varnish & Insulator Co., Irvington, N. J.

C. R. H. Carlson has been named district manager in charge of the Chicago area, Watson-Standard Co., Pittsburgh.

John S. Thompson and **Robert H. Madden, Jr.,** have been named assistant managers of sales, Central Sales Division, Columbia Steel Co., San Francisco.

David Kirk Stuart has been named manager, Pittsburgh branch, Crucible Steel Co. of America, New York. **Richard J. Rand** has been named assistant branch manager.

Hugh C. Land, assistant to the production manager, Pennsylvania Salt Mfg. Co., Philadelphia, has been named production manager.

SURE, I'LL BRING MY TOOLS. DO I NEED A CALCULATING MACHINE, TOO?
CALCULATING MACHINE?
YES! THE LAST PLACE I WORKED THEY USED 12 DIFFERENT MAKES OF CUTTING TOOLS, IT TOOK US FOREVER TO PIECE TOGETHER OUR TOOLING ON A NEW SET UP. I THOUGHT A CALCULATING MACHINE MIGHT HELP.
NOT HERE! WE STANDARDIZE - SAVES TIME - IN PURCHASING, STOCK KEEPING, THE TOOL CRIB, AS WELL AS IN THE SHOP.

Features of Standard Shield Brand Tools

1. Foremost Quality—In design—workmanship—material. **2. Complete Line**—One reliable source of supply for drills, reamers, taps, dies, milling cutters, end mills, hobs, counterbores, and special tools. **3. Complete Service Stock**—Over 10,000 items regularly carried in factory stock. **4. Nation-wide Availability**—Stocked and supplied by leading Mill Supply Distributors coast to coast. **5. Men Who Know Their Business**—Our service staff has the advantage of 68 years of accumulated experience in solving tough problems.

Standardize on Shield Brand Tools for uniform cost reducing performance

STANDARD TOOL CO.

CLEVELAND 4, OHIO

New York · Detroit · Chicago

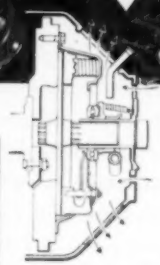
THE STANDARD LINE: Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools

Power Plus-

for lifting and transporting full capacity loads

every handling job is easier with TOWMOTOR MH!

With engines especially geared for heavy-duty industrial use, with plenty of power and speed to spare—even for the heaviest loads—Towmotor cuts 20% to 30% from your production costs. Compare Towmotor with any other fork lift truck and you will see why Towmotor's sturdy features make every **M**ass **H**andling job easier, faster, safer. 12 models plus standard and specially designed accessories handle loads from 1500 to 15,000 lbs.—a Towmotor for **every** job. Write for a copy of "Handling Materials Illustrated." Towmotor Corporation, Division 56, 1226 E. 152nd St., Cleveland 10, Ohio. Representatives in all Principal Cities in U. S. and Canada.



HEAVY DUTY CLUTCH
—air cooled for longer life

Clutch engagements reach 500 an hour in especially heavy service, producing high temperatures in clutch and flywheel assemblies. So Towmotor clutches are **extra** large, **fully** ventilated . . . to provide for quick **dissipation** of heat!

Ask to see the Towmotor movie, "The One Man Gang," right in your office.

TOWMOTOR
THE ONE-MAN-GANG

FORK LIFT TRUCKS and TRACTORS

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

Joseph R. Bransford, personnel director, Western Electric Co., Inc., has been elected financial vice president, succeeding **George L. Best** who resigned to accept a vice presidency with American Telephone & Telegraph Co. **Timothy E. Shea,** president and a director of Teletype Corp., Chicago, a Western Electric subsidiary, succeeds Mr. Bransford as personnel director. **John J. O'Brien,** vice president of teletype, succeeds Mr. Shea as president.

Van H. Leichliter has been named assistant vice president, American Steel & Wire Co., Cleveland. He was general superintendent of the company's South Works, Worcester, Mass., where he has been succeeded by **Umbert F. Corsini.**

R. A. Roosevelt has been named sales manager, Eriez Mfg. Co., Erie, Pa., succeeding **George R. Wellmon,** resigned.

P. C. Buck has been elected vice president, production, Acheson Colloids Corp., Port Huron, Mich. **M. W. Reynolds** has been elected vice president, sales, and **Raymond Szymanowitz,** vice president, research.

Charles F. Cooper has been named assistant sales manager, central district, Kaiser Steel Corp., Oakland, Calif. The district covers northern California, southern Oregon, Idaho, Utah, Montana and Nevada.

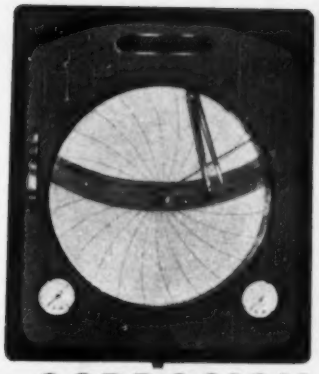
Samuel McClements, Jr., has been named manager of sales, Railroad Materials and Commercial Forgings Div., Carnegie-Illinois Steel Corp., Pittsburgh, and **Richard W. Claypoole** has been named assistant manager. Other appointments: **F. Royal Gammon,** manager of sales, eastern area; **Wesley C. Bobbitt,** manager of sales, New York district office; **Dwight L. Merrell,** manager of sales, Philadelphia district; **Donald K. Wright,** assistant manager of sales, Philadelphia. **Paul E. Thomas** has been named assistant general superintendent in charge of service departments, Gary steel works.

John P. Critchlow has been named chief fuels and lubricants engineer, rolling mill section, industrial products engineering, Gulf Oil Corp., Pittsburgh.

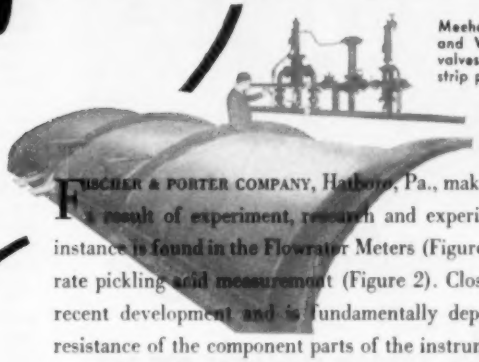
George A. Ingalls, comptroller of American Machine & Foundry Co., New York, and **John W. Herman,** treasurer of Lukens Steel Co., Coatesville, Pa., have been elected to the board of directors of AMF.

Oliver J. R. Troup, Jr., has been named sales engineer, Atlas Chain & Mfg. Co., Philadelphia. He will cover the eastern Pennsylvania, New York State and Maryland sales territories.

(*Fig. 1*)



"MEEHANITE® METER FITTINGS ACCEPTABLE for CORROSION RESISTANCE"



Meehanite FLOWRATOR flow meters and VALVRATOR diaphragm motor valves for continuous proportioning strip pickler at a tin plate mill.

(*Fig. 2*)

FISCHER & PORTER COMPANY, Hatboro, Pa., make the headlined statement as a result of experiment, research and experience in the field. A specific instance is found in the Flowrator Meters (Figure 1) applied to achieve accurate pickling acid measurement (Figure 2). Close measurement control is a recent development and is fundamentally dependent upon the corrosion resistance of the component parts of the instrument.

In this application the flowmeter measures 60° to 66° Baume sulphuric acid.

Considerable research has been devoted to the development of a number of Meehanite metals to meet specific corrosive problems. However, in all applications of Meehanite castings the problem is attacked from the standpoint of the achievement of the proper metallurgical constitution of the material to give maximum service, whether it be resistance to wear, heat, corrosion or destructive stresses.

If you are faced with problems involving castings which must provide the maximum combination of properties for your needs, turn to your Meehanite foundry for the answer. Ask for the Handbook of Meehanite Metals.

Take Your Casting Problems To A MEEHANITE Foundry!

American Brake Shoe Co. — Mahwah, New Jersey	Florence Pipe Foundry & Machine Co. — Florence, New Jersey	Pelton Foundry & Machine Co. — Buffalo, New York
The American Laundry Machinery Co. — Rochester, New York	Fulton Foundry & Machine Co., Inc. — Cleveland, Ohio	The Prescott Co. — Menominee, Michigan
Atlas Foundry Co. — Detroit, Michigan	General Foundry & Manufacturing Co. — Flint, Michigan	Rosedale Foundry & Machine Co. — Pittsburgh, Pennsylvania
Banner Iron Works — St. Louis, Missouri	Greenlee Foundry Co. — Chicago, Illinois	Ross-Meehan Foundries — Chattanooga, Tennessee
Barnett Foundry & Machine Co. — Irvington, New Jersey	The Hamilton Foundry & Machine Co. — Hamilton, Ohio	Shenango-Penn Mold Co. — Dover, Ohio
E. W. Bliss Co. — Hastings, Mich. and Toledo, O.	Johnstone Foundries, Inc. — Grove City, Pennsylvania	Smith Industries, Inc. — Indianapolis, Ind.
Builders Iron Foundry Inc. — Providence, Rhode Island	Kanawha Manufacturing Co. — Charleston, West Virginia	Standard Foundry Co. — Worcester, Massachusetts
H. W. Butterworth & Sons Co. — Bethayres, Pennsylvania	Koehring Co. — Milwaukee, Wisconsin	The Stearns-Roger Manufacturing Co. — Denver, Colorado
Continental Gin Co. — Birmingham, Alabama	Lincoln Foundry Corp. — Los Angeles, California	Traylor Engineering & Mfg. Co. — Allentown, Pennsylvania
The Cooper-Bessemer Corp. — Mt. Vernon, Ohio and Grove City, Pa.	E. Long Ltd. — Orillia, Ontario	Valley Iron Works, Inc. — St. Paul, Minnesota
Crawford & Doherty Foundry Co. — Portland, Oregon	Otis Elevator Co., Ltd. — Hamilton, Ontario	Vulcan Foundry Co. — Oakland, California
Farrel-Birmingham Co., Inc. — Ansonia, Connecticut	The Henry Perkins Co. — Bridgewater, Massachusetts	Warren Foundry & Pipe Corporation — Phillipsburg, New Jersey

"This advertisement sponsored by foundries listed above."

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PERSHING SQUARE BUILDING • NEW ROCHELLE, N. Y.

Threadwell Tools do many jobs

they can do your tough ones

For the answer you've been looking for, call in your nearest Threadwell Distributor. You can get his name as well as complete information by mailing the coupon below.

THREADWELL TAP & DIE CO., Greenfield, Mass.

Send me free Bulletins checked below

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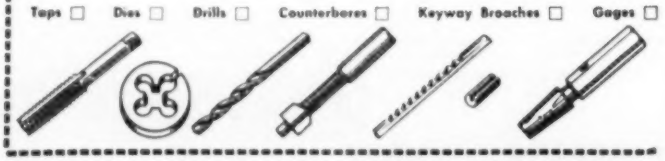


George C. Jellife has been named eastern district manager, Ilg Electric Ventilating Co., Chicago.

J. Philip Murphy, formerly executive vice president, Judson Pacific-Murphy Corp., Emeryville, Calif., has been elected president. He succeeds **Paul F. Gillespie,** retired. **Carlos J. Maas** has been elected chairman.

Ressler A. Dusseau has been named manager of the engineering cost control dept., Automatic Transportation Co., Chicago.

William O'Neil, Jr., has been named plant manager of the Bowling Green, Ky., water cooler plant of General Electric Co.'s Air Conditioning Dept., Bloomfield, N.J. **David M. Rush** has been appointed materials engineer of the Air Conditioning Dept.'s manufacturing div. **Richard Cutts, Jr.,** has been named manager of sales for the central station divisions of the Apparatus Dept., Schenectady. He was formerly assistant manager of sales for the GE meter and instrument divisions at Lynn, Mass., in which position he has been succeeded by **Donald E. Craig. Dr. F. E. Satterthwaite** has been named quality control engineer of the plastics div., Chemical Dept., Pittsfield, Mass. **Leland T. Weller,** carboloy specialist for the Apparatus Dept., has retired.

N. L. Watkins has been named chief development engineer, Almco Div., Queen Stove Works, Inc., Albert Lea, Minn. Previously he was with Westinghouse Electric Corp. as manufacturing engineer at Pittsburgh.

Roy J. Dusseau has been named general manager of Meisel Machine & Tool Co., Toledo, succeeding **Ted Osborne,** resigned. Mr. Dusseau, president and owner of Dusseau Die Service Co., has announced sale of that firm to a local company. Prior to formation of his own company, he served as assistant plant manager of Avco Tool & Machine; chief tool engineer of American Propeller Corp., and assistant master mechanic of Northern Aircraft Products Co.

John J. McCarroll, formerly with the Hartford office of Brown & Sharpe Mfg. Co., Providence, has been appointed in charge of the Rochester office of Brown & Sharpe of New York, Inc. He succeeds **John H. Biggs** who is now in charge of Brown & Sharpe's Philadelphia office.

Harlan W. Burbank has been named district representative, Federal Machine & Welder Co., Warren, Ohio, covering southern Ohio, western part of West Virginia, and Kentucky.

James C. Hartley, metallurgist, has been appointed a staff executive at Winchester Repeating Arms Co., New Haven, Conn., a division of Olin Industries, Inc. He was vice president and general manager of Barium Steel & Forge, Inc., Canton, Ohio, and previously had been director of research for Heppenstall Co., Pittsburgh, and chief metallurgist of Aluminum Forgings, Inc., Erie, Pa.

Richard G. Johnson has been named sales manager of Van Auken, Inc., a subsidiary of Penn-Ohio Steel Corp., Birdsboro, Pa. He will make his headquarters in Detroit. Mr. Johnson was with Cello Products Co., East Boston, Mass., as sales manager, and previously was with Snow Sales Co., Spokane, Wash., and Plymouth Motor Corp., Detroit.

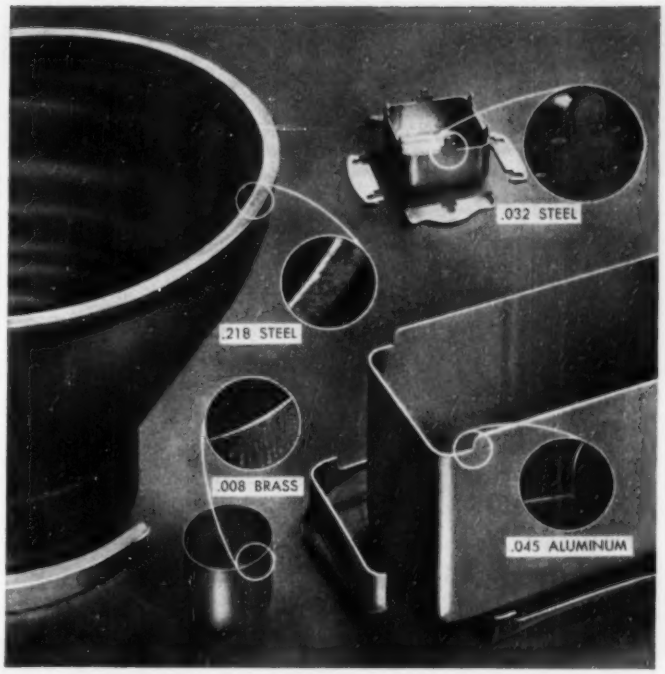
F. W. Halliwell, chairman and managing director of Gay's (Hampton) Ltd., England, was re-elected president of the Gauge and Tool Makers' Assn, London, for the 1949-50 session. **H. S. Holden**, managing director of Brooke Tool Mfg. Co., Ltd., was re-elected chairman; **A. L. Dennison**, chairman of Birmingham Tool & Gauge Co., Ltd., was re-elected vice chairman of the association, and **R. Kirchner**, director of Arnott & Harrison, Ltd., was re-elected honorary treasurer.

G. J. Berry, vice president and sales manager of Electric Products Co., Cleveland, has been named field sales manager.

George A. Gade, former district manager of the Detroit office, has been named regional sales manager in charge of Midwest territories, for Standard Pressed Steel Co., Jenkintown, Pa. He will make his headquarters in Detroit. Succeeding Mr. Gade as Detroit district manager is **Francis J. Kinsella**, who has been a sales representative in that area. **David J. Hurford**, Cincinnati area district manager, has been named special representative for aircraft products in the West Coast area. **William C. Harper**, former SPS representative in the New England area, has been selected for the Cincinnati post, and **A. Clayton Graham** replaces Mr. Harper in the New England territory.

Charles H. Glasier, Jr., has been named manager of distribution for Air Reduction Sales Co., a division of Air Reduction Co., Inc., New York.

Lawrence B. Richardson has been named director of research, Fairchild Engine & Airplane Corp., Hagerstown, Md. Formerly president of the company, Mr. Richardson remained as a consultant to the new management following a proxy contest last July, which resulted in election of a new board.



Could your shell be in this picture?

One of the amazing things about the Brehm Trimming Die is that stock thickness doesn't make much difference. Take a look at the shells shown above. They range from .008 brass to .218 steel. If you make a shell within that range, or maybe beyond it depending on material, you should be able to increase production and decrease cost with a Brehm Trimming Die.

Materials? Almost anything . . . gold, silver, stainless or mild steel, copper, brass, zinc, aluminum, fiber, rubber or plastics.

Thicknesses? In actual manufacture, from .008 brass to .218 steel, a range likely to cover most of your normal requirements.

Quantities? As high as 1200 per hour, where the small shell and scrap were blown from the die. Electric iron covers at 625 per hour, and large refrigerator doors at 264 per hour!

Shapes? Fountain pen ferrules, watch cases, cigarette lighters, burial vaults, cameras, automotive and kitchen accessories, radio and television parts . . . oh, well, never mind . . . what shape do *you* need trimmed?

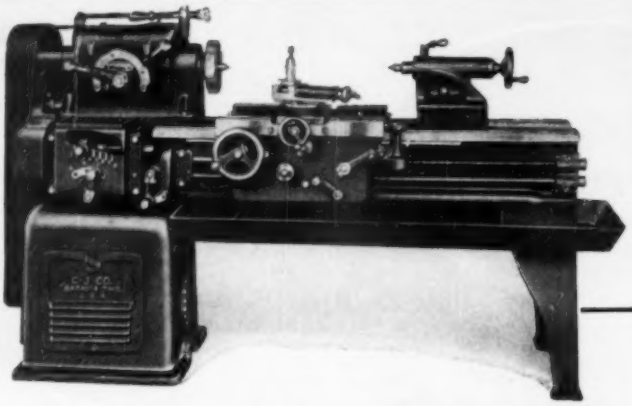
The part . . . *your* part . . . may have straight or curved edges, notches, angles or projections. A Brehm Die will trim it completely in one press stroke, leaving full-metal thickness edges, no burrs and no draw marks on the shell.

See a Brehm Die Work. Visit Our Booth #431, at the ASTE Show.

Write today . . . for full details of the Brehm Trimming Die. The Steel Products Engineering Co., 1297 West Columbia Street, Springfield, Ohio.

THE "SHIMMY" DIE REG. U.S. PAT. OFF. ®

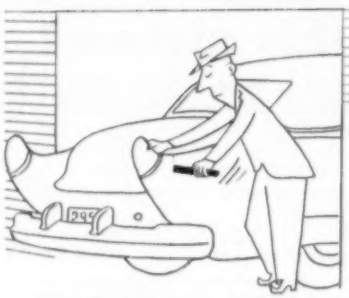
Brehm®
TRIMMING DIES



C. & J. Geared Head LATHE 16 INCH 12 SPEED

● Designed for high quality general service. Built in one size and one model only. Powerful, accurate, tooled and equipped to produce efficiently. Features exceptionally long carriage bearing (23⅜"). Feed is provided by separate rod, so lead screw is used only for thread chasing. Complete regular equipment includes thread indicator. Guaranteed accurate within .001 inch in 14 inches. *Write for new descriptive bulletin 38-A-8.*

CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO



It's the CUT that COUNTS

and Capewell HACK SAW BLADES offer 2 Exclusive Advantages . .

Ask Your Distributor about . . .

Capewell hack saw blades and frames, band saws (in coils or welded), Defiles, ground flat stock, hammers, compass and keyhole saws.

1 A bonus of 10% additional cutting—because Capewell's exclusive "Statistical Quality Control" raises standards and eliminates substandard blades.

2 Instructions printed right on the hand hack saw blades indicating correct use.

CAPEWELL
THE KEY TO ECONOMY

THE CAPEWELL MFG. CO. DEPT. 34, HARTFORD 2, CONN.

J. A. Cuneo, formerly branch manager, Los Angeles, for Fairbanks, Morse & Co., Chicago, has been named manager of the Chicago branch. **A. M. McLaren** succeeds him at Los Angeles. **John S. King** has moved from Chicago to Cincinnati as branch house manager of that sales area, succeeding **J. S. Peterson,** who is now attached to the sales manager's office in Chicago. **William H. Kingsley** has joined Fairbanks-Morse as manager of the Electrical Div.

John McVeigh has been named special development engineer, Kennametal, Inc., Latrobe, Pa.

J. K. Beidler has been named asst. general manager, Machinery Div., Dravo Corp., Pittsburgh. Other appointments: **R. M. Rush,** manager of sales development; **H. M. Graham,** manager of Apparatus Dept.; **D. R. Berg,** manager, Heating Dept.; **B. B. Reilly,** manager, Air Conditioning & Combustion Dept. **G. P. Smith** was named purchasing agent succeeding Mr. Beidler.

W. A. Hill has been named general manager of Burndy Canada Ltd., Toronto. He was formerly general manager of Noma Electric Co. of Canada, Ltd. Other appointments: **Roy Bunston,** chief sales engineer; **Al Thomson** and **Fred McLenaghan,** sales engineers; **Bryce W. Kell,** district sales manager, covering Quebec Province and the Maritimes.

John H. Kishman has been named district manager, Simonds Abrasive Co., Philadelphia, for the Ohio district excepting Toledo, and for western Pennsylvania, centering in Cleveland and Pittsburgh.

Business Items

E. V. Prentice Co., Portland, Ore., has been made exclusive Pacific Northwest sales representative of Wood hydraulic presses.

Stover Lock Nut & Machinery Corp., Easton, Pa., has purchased a new, larger plant at Hilton & Holly Streets, Easton, Pa. All operations are now being conducted at the new plant.

Allied Research Products, Inc., Baltimore, has purchased R. A. Hoffman Chemical Co., Cleveland. R. A. Hoffman, formerly owner of the latter firm, has joined Allied to head up development of new types of organic finishes.

Link-Belt Co., Chicago, has opened a factory branch store and warehouse at 2630 Holmes Street, Kansas City, Mo., with Arthur J. Olson, district manager, in charge.

Hill-Acme Co., Cleveland, has named Tom J. Rutledge and Roy E. Charbonneau as sales representatives for its forging machines in lower Michigan and Lucas County, Ohio. They operate Charledge Sales, Detroit, which is their headquarters.

James A. Setchell has been appointed sales agent for Allen-Bradley Co., Milwaukee, in southern California and State of Arizona, with offices at 301 West "G" Street, San Diego, Cal.

Wallace F. Schott, 6516 Detroit Avenue, Cleveland, has been appointed sales representative for Holcroft production heat treat furnaces in eastern Ohio and western Pennsylvania.

E. J. Edson has become sales agent in Western Michigan for Fox Engineering Co.'s line of multiple spindle drilling and tapping machines and hydraulic presses. His headquarters are at 1405 Hoyt Street, Muskegon Heights, Mich. Bert Carpenter Co. continues to represent Fox in eastern Michigan.

George K. Garrett Co., Philadelphia, is enlarging production facilities with a new plant in Elwood City, Pa., with more than 50,000 sq ft of manufacturing space. Huge stamping presses custom built to Garrett specifications will be installed. All plating requirements of finished products will be handled in the new plant.

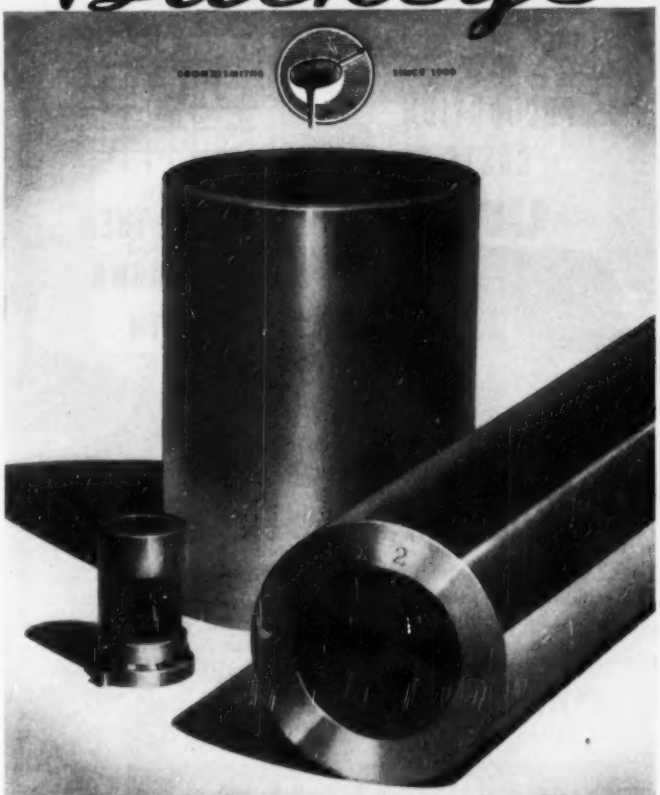
Ohio Electric Mfg. Co., Cleveland, has purchased all assets, except the plant, of Wright Hoist Div., Lisbon Hoist & Crane Co., Lisbon, Ohio, and has also purchased the nail-making machine business of Black Industries, Inc., Cleveland. The "Bob Cat" hoist of Wright Hoist will hereafter be manufactured in the Ohio Electric plant with full production now scheduled for April.

Commercial Forgings Co., Cleveland, has purchased the forge dept. of Johnson & Jennings Co. Purchase includes goodwill, all tooling and hollow boring equipment, some machine tools and the department's inventory.

American Brake Shoe Co. has opened a sales office in Houston, Tex., with William C. George in charge. Mr. George will represent the company's American Manganese Steel, Electro-Alloys and National Bearing Divisions in Texas, Oklahoma and Louisiana.

Stolper Steel Products Corp., Milwaukee, has been relocated in a new factory on a 38-acre site at Menomonee Falls, Wis., a Milwaukee suburb. The new plant will be completed before the end of 1950.

Buckeye



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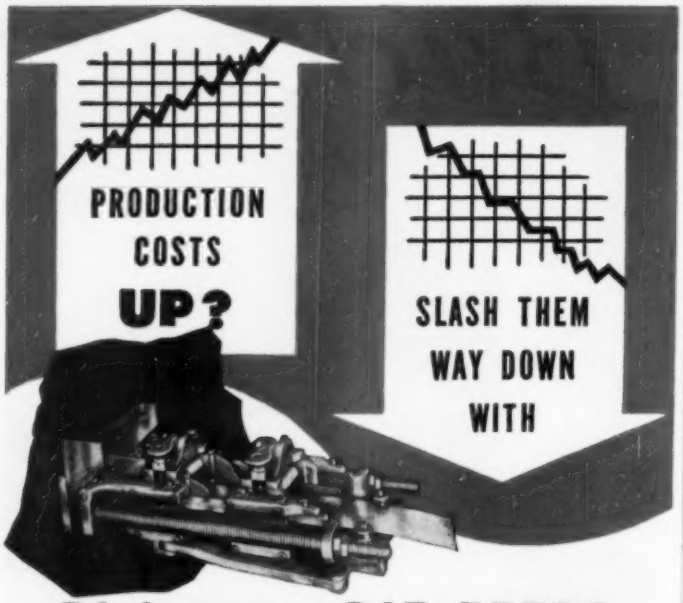
FULLY MACHINED BARS
SPECIAL BEARINGS

Producing millions of standard and special bronze bearings for thousands of power transmission applications has taught us a lot about bronze, the ideal bearing metal. Our specialized service to America's industries for nearly a half century, enables us to offer highest quality bearing bronze at a cost made possible only by latest production methods. Do you have a special bearing problem? The Buckeye Brass and Manufacturing Company, 6410 Hawthorne Avenue, Cleveland 3, Ohio.

BEARING BRONZE



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WORK LOADERS

Applied to Machine Tools

Increased productivity through the application of work loaders to machine tools is the timely subject of a Special *American Machinist* Report to Metalworking. Descriptive diagrams, schematic drawings, and illustrations supplement the text . . . which covers case examples applied to boring, broaching, gear-cutting, grinding, honing, milling, threading and turning machines.

Twenty-four pages; 25c per copy

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Signed .....

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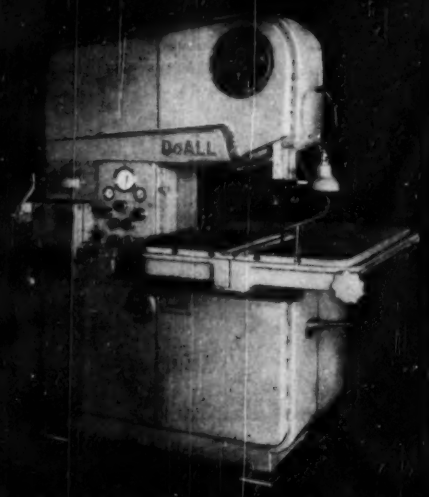
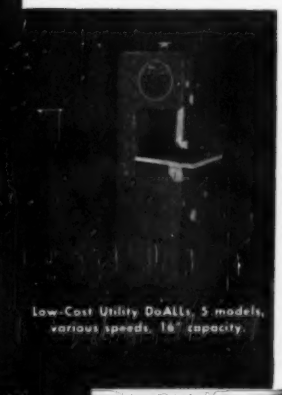
Efficiency of . . .
Continuous BAND CUTTING
Now Extended to the MACHINING of ALL SOLID MATERIALS

New DoALL Band Machines and Cutting Tools for 1950 give up to 200% faster production cutting and up to 100% longer tool life. Tough alloys and other materials that have defied economical cutting are now profitably machined.



Contour-matic—the first Band Machine Tool with Complete Hydraulic operation.



Low-Cost Utility DoALLs, 5 models, various speeds, 16" capacity.

Super Zephyr—21 models for high speed sawing.

Contour Machines—5 models from 16" to 60" capacity.

SEE DEMONSTRATIONS at A. S. T. E. SHOW
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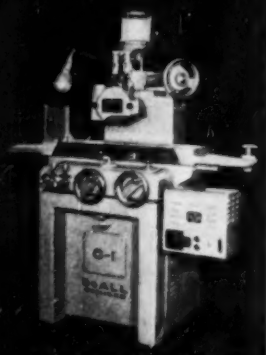
These latest Tool Room and Manufacturing Tools will be in operation on materials demonstrating:

Line Milling	"Cool Grinding"
Line Grinding	"Crush Grinding"
Friction Sawing	Integrated Inspection

DoALL Exhibit #121 and #125

Gage Blocks are integrated with a complete line of measuring instruments.



"Cool Grinding" and the DoALL Super Precision Grinder, 7 models.

27 Kinds BAND CUTTING TOOLS for

Line Milling
Line Grinding
Contour Sawing
Friction Sawing
Continuous Filing
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Warren announces

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THE SUCCESSOR TO GREASE

Never Melts!

★ ALL-PURPOSE
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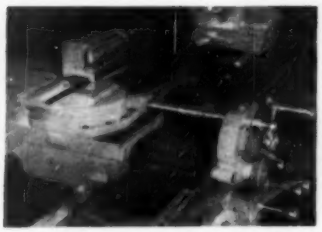
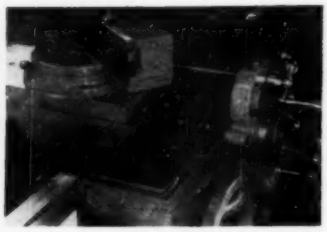
Rush my sample of PLASTILUBE

NEW SHOP EQUIPMENT MATERIALS AND PARTS



Ball-turning rest set up for turning a ball on Monarch lathe



Same unit set up for machining concave spherical surface

Ball-Turning Rest Designed for Monarch 14-, 16-, 20-In. Lathes

With this ball-turning rest a 4-in. ball can be turned on the 14-in. Monarch Series 60 engine lathe, a 5¾-in. ball on the 16-in. machine, and a 6-in. ball on the 20-in. unit. Socket boring is also facilitated by the accessory; maximum size for the 14- and 16-in. machines being 4 in. and for the 20-in. unit, 6 in. Concave spherical surfaces up to 11 and 12 in. can be machined.

The regular bottom slide may be positioned either on center for ball turning or boring, or out of alignment with the spindle center for spherical radius turning. A micrometer dial is provided to adjust the bottom slide in or out. Diameter of the ball or radius being turned also can be controlled accurately by means of a similar micrometer adjustment.

The Monarch Machine Tool Co., Sidney, Ohio

Portable Air-Powered Sander Adaptable to Cup-Wheel Grinding

The Stream-Power sander is equally adaptable to medium-duty sanding or light-duty cup-wheel grinding. Tools are said to be smaller and 10% lighter than previous models of equal capacity and provide 25% more power. Sanders are available with speeds of 2400, 3600, 4500, 6000, and 7500 rpm, for use with 5- or 7-in. sanding pads. For grinding wheel, sizes of 4, 5, or 6 in. are accommodated.

Buckeye Tools Corp., 21 W. Apple St., Dayton 1, Ohio

Magnesium-Treated Cast Iron Available in Parts, As Material

Ductile Cecolloy is a high-carbon cast iron, treated with magnesium. It is said to retain the self-lubricating and vibration-damping properties of cast iron while eliminating the inherent weakness of normal cast iron. Castings weighing up to 40,000 lb, which have high tensile and yield strengths, and elastic modulus, as well as a substantial amount of ductility, are reported by The Chambersburg Engineering Co.

This cast iron can be produced to

AO Panoram Goggles

Workers look at things Broadly and Safely in PANORAM...

goggle of Wide-Angle Vision!

When eye protection against flying particles from any direction and *wide* lateral vision are required on the job, the Panoram with its exceptional seeing area is the choice of workers and safety directors everywhere. What's more, it may be worn over personal glasses with the greatest of comfort. Available with clear or green frames, clear or green lenses. Your nearest AO Safety Products Representative has this popular goggle.

Quick Facts

- Plastic eyecups conform closely, smoothly to face for maximum safety and comfort. Perforations at top and bottom give ample ventilation—reduce possibility of fogging.
- Bridge is comfortable floating saddle type—fits without pressure.
- Lenses are shatter-resistant acetate—easily replaceable. Order green lenses when ultra-violet radiations and glare are hazards.

Available with rubber cushions at extra cost as illustrated.

American Optical
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

SENTRY ELECTRIC FURNACES

FOR QUALITY HIGH SPEED STEEL HARDENING

Sentry Electric Furnaces produce quality hardening, maximum toughness and exceptional durability in high speed steel and high carbon high chrome. Edges stand up longer which means less frequent grindings, longer tool life and lower tool costs.

Sentry Furnaces utilize Sentry Diamond Blocks permitting full soaking of tools without danger of burning. No scaling. No decarburization. Produce a clean finish which eliminates finishing operations.

Ask for Catalog F17

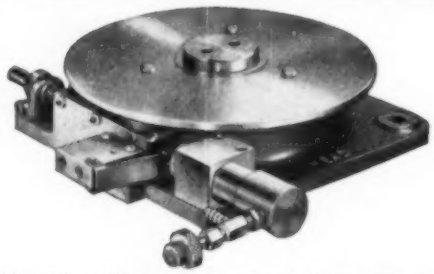
Sentry Model "5Y" — For hardening larger tools and cutters. Flexible, economical, quick to heat up.

The Sentry Company

FOXBORO, MASS., U.S.A.

Sentry DIAMOND Block

Air Operated ROTARY WORK FEEDER



Deftly holds and delivers small parts to drill, tap, swage, stake, etc. Stations accurate to .002". Guaranteed against over-travel or "skipping." Indexes as slow or fast as you like, up to 10,000 per hour. Compact and sturdy, easy to tool and hook up.

Standard dial plate 10"; available in 12". For a new job, simply tool up a new dial. Readily combines with "MEADMATIC" Timer, Air Hammer, Air Press, Drill presses, etc.—to make almost completely automatic machine—operator merely loads.

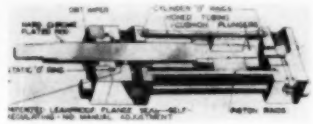
Write for full details.

MEAD SPECIALTIES COMPANY

4114 NO. KNOX AVE., DEPT. MA-40, CHICAGO 41, ILL.

specifications within the range of the following physical properties, as cast: Tensile strength 60,000 to 80,000 psi, yield strength 40,000 to 60,000 psi, elongation 0 to 15%, and modulus of elasticity 22,000,000 to 25,000,000 psi. Machinability is said to be equal to or better than cast steel and fine finishes are reported easily attained. Available in both large and small castings, Ductile Cecolloy is also marketed as material for the heavy casting field.

The Chambersburg Engineering Co.,



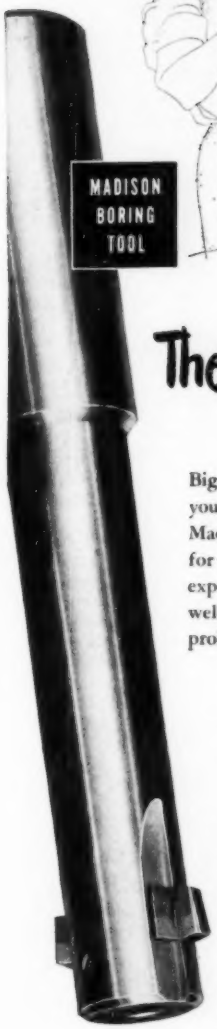
High-Pressure Cylinder Line Provides 1½- to 12-in. Bores

Hydraulic cylinders that meet the recently approved JIC hydraulic standards are available in a complete standard line from 1½- to 12-in. bores, for 2000- to 3500-psi operation. They have solid steel heads, caps, and mountings. "O" rings provide leakproof pressure sealing at cylinder ends; a patented leather-rod seal assembly is said to permit friction-free, leakproof operation of the reciprocating rod; and the cylinder tubing has been bored to a 15 micro-inch polished finish within 0.0005 tolerance. Air bleeds are available to prevent air entrapment, and cushioning at one or both ends can be applied on the same mounting dimensions as non-cushion cylinders.

Miller Motor Co., 4027 N. Kedzie Ave., Chicago 18, Ill.

Bronze Coat Electroplated To ID of Guide Bushings

These bushings are of hardened steel with 0.001 to 0.002 in. of bronze electroplated on the inside-diameter bearing surface. The bushings are said to offer the long-wearing quality of hardened steel without the danger of scoring or seizing when run on hardened steel. An oil groove, 5/32 in. wide is machined into the inside



The Men with the Holes in their Heads!

can lower your boring costs

Big holes! Little holes! Deep holes! How can we bore 'em better for less? This may be your problem occasionally. But boring holes at lower cost is the full time problem for Madison engineers. This specialization can save *you* money just as it is doing every day for leading manufacturers. Why not take advantage of the two big things — Madison experience and Madison tools — that can cut cost on your production boring jobs. You're welcome to put another hole in one of our engineers' heads. Ask them to consider your problem and come up with a cost lowering idea. No obligation, of course.

BETTER BORING TOOLS

Madison Cutters in Madison Bars . . . the best in boring tools. Madisons give you superior finishes, in most cases equalled only by grinding. Tolerances to .0003. Two-bladed cutter that expands to make up for wear in regrinding — also quickly changed from one size to another with no disturbance of the set-up. Cutter floats in the bar — no special floating tool holders needed. More holes per cutter before regrinding and more regrinds per cutter (about 10 times as many as similar tools) . . . and many other original Madison features of design.

MORE BORING EXPERIENCE

For 35 years Madison has concentrated on solving boring problems. With this background of experience applied to your production job, you can count on the best solution to save your money. What's more, you can count on a recommendation based on a complete line of boring tools.

Write for the information filled Madison Catalog: It is yours for the asking.

SEE MADISON AT BOOTH 513
A.S.T.E. EXPOSITION
PHILADELPHIA APRIL 10-15

MADISON MANUFACTURING CO.
DEPT. AM **MUSKEGON, MICHIGAN**

Aircomatic welding process Ups production of home heater units 71%... cuts manufacturing costs

THE STEW ART-W ARNER CORPORATION, South Wind Division, Indianapolis, Indiana, had a problem joining the upper and lower halves of its "Safe-Air Gas Home Heater". Established methods—bolting, or conventional arc welding were inadequate for today's production demands.

D. P. Carey, Airco Technical Sales Representative, was called in. He suggested the completely new, high speed, inert gas-shielded metal arc method of welding stainless steels, aluminum and other hard-to-weld metals . . . the Aircomatic Process. Two heaters were shipped to the Airco laboratory for test welding. The test was 100% successful, and the company immediately ordered Aircomatic equipment and put it to work on a production-line basis.

As a result, former production of 7 units per hour has been increased to 12 units per hour . . . with an accompanying reduction in production costs.

If you want more information about Airco's Aircomatic Welding Process, write your nearest Airco office for copies of forms ADR-53 and ADC-661.

TECHNICAL SALES SERVICE—ANOTHER AIRCO PLUS-VALUE FOR CUSTOMERS

AIRCO **AIR REDUCTION**

Offices in Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Calcium Carbide . . . Gas Cutting Machines . . . Gas Welding Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

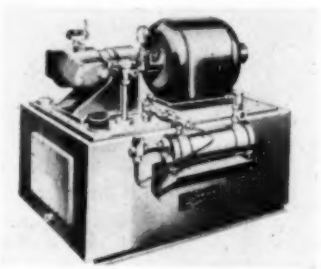
diameter in a double figure 8 pattern. The groove is fed by an Alemite fitting mounted on the collar of the bushing.

Lamina Dies & Tool, Inc., 14925 W. Eleven Mile Road, Barkley, Mich.

Monorail System for Light Overhead Loads

The Trambeam monorail materials-handling system is for overhead handling of light loads and shorter spans. It is interconnectable with conventional Trambeam. It consists of a one-piece rail section with flat tread made of high-carbon steel. The rail and its hangers are flexibly suspended to eliminate torsion on the hanger rods and to equalize wheel loads. The T-Beam tramrail systems are engineered, fabricated, and erected for each individual job.

Whiting Corp., Harvey, Ill.



Oil-Hydraulic Pumping Units For High-Pressure Applicatons

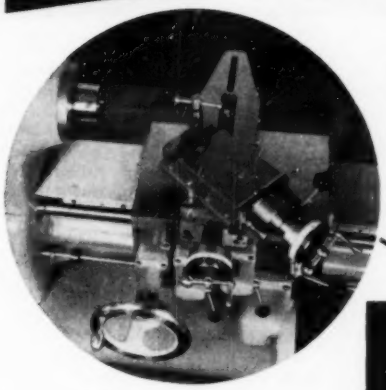
Pumping units are designed to meet a wide range of fluid-power requirements for machine tools and other industrial equipment. High-pressure

HARDINGE
ELMIRA, N.Y.

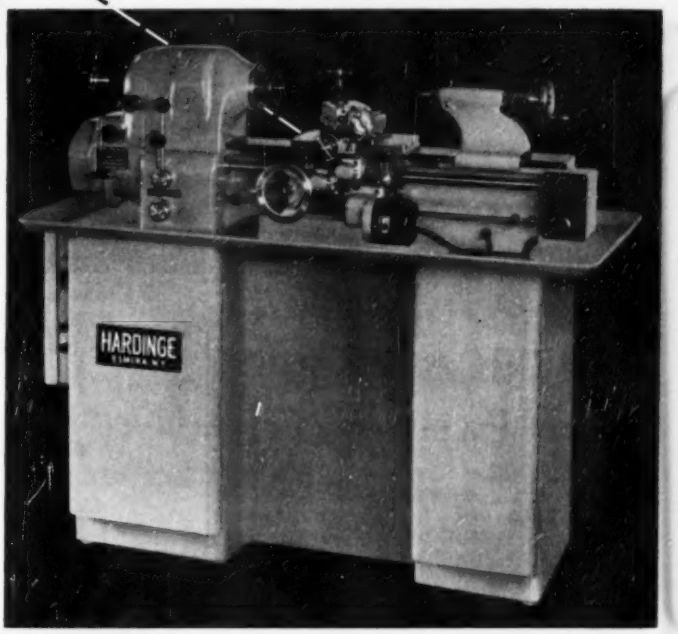
"THE MODERN TOOL ROOM LATHE"

with the

FULL BEARING CARRIAGE



- Solid Steel Hardened and Ground Bed Ways for Carriage
- Full Bearing on Top of Bed
- Full Bearing on Side Dovetails
- Sustained Accuracy and Absolute Rigidity



Model HL HARDINGE TOOL ROOM LATHE

Put this modern machine to work in your tool room —for your profit.

Design incorporates all features for high speed operation and extreme accuracy to cut your costs.

This low-cost machine will free larger tool room machines for large work, thereby giving added capacity on the most economical basis.

DIAMOND ANNIVERSARY
HARDINGE
ELMIRA, N.Y.
1890-1950

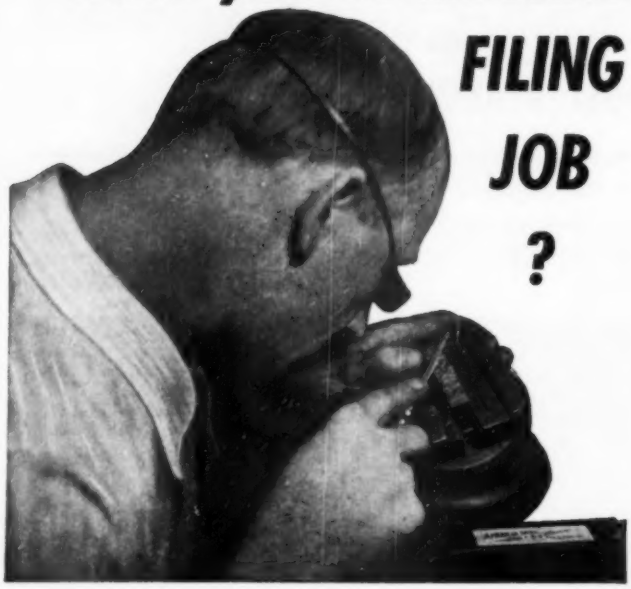
OTHER FEATURES:

- Precision Gear Box for Threading Only
- Independent Variable Electric Feed for Carriage and Cross Slide
- Preloaded Ball Bearing Spindle Construction
- Easy Reading Black-and-White Feed Screw Dials

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

SEE THIS MACHINE IN OPERATION—SPACE 835 A.S.T.E. EXPOSITION PHILADELPHIA

Have you an Intricate FILING JOB ?



Use

"AMERICAN SWISS"

Swiss Pattern Files

Sharp edges, close corners, tiny fillets, delicate curves . . . the troublesome contours of intricate filing jobs . . . are best handled with "American Swiss" Swiss Pattern Files. You can get these precision tools in widths as small as 1/16-in., thicknesses as small as .025 gauge, and in cuts as fine as No. 6. The extensive "American Swiss" line of more than 3000 shapes, sizes and cuts provides a selection to meet every intricate filing need.

Also American Pattern Files, Milled Curved Tooth Files, Rotary Files and Burs, and Mechanics' Tools.

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AMERICAN SWISS FILE & TOOL CO.
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American Swiss

SWISS PATTERN FILES

units are available in 22 models, engineered to specifications recommended by the J.I.C. hydraulic standards for industrial equipment. They provide regulative pressures up to 5000 psi.

Each unit consists of a reservoir based with all operating components, including pump, relief valve, gages, and electric-motor drive mounted on a removable top cover. Reservoirs are supplied in capacities of 50, 110, and 165 gal. The bottom of the reservoir is above floor level and is sloped slightly to facilitate draining. Denison axial-piston hydraulic pumps for either constant or variable volume are available, delivering up to 9 gpm at 18,000 rpm up to 20 gpm at 12,000 rpm; and up to 35 gpm at 12,000 rpm; all for service up to 5000 psi.

Motors supplied with this equipment range from 5 to 75 hp according to requirements of service.

The Denison Engineering Co., Columbus, Ohio

Steel Frame, Hardwood Deck Combined in Platform Truck

Decks in sizes from 24x48 to 36x72 in. of 13/16-in. dressed paraffin oil-treated hardwood, are available on the steel frame Rapid-Standard platform trucks. Arc-welded frames are 3⅛ in. deep, of 10-gage formed-channel steel. Tilt or level trucks can be obtained with capacities up to two tons. All casters are of double-raceway construction.

The Rapid-Standard Co., Inc., Dept. CPT, 342 Rapistan Bldg., Grand Rapids 2, Mich.

Liquid Stainless Steel Applied By Spraying, Brushing, Dipping

The corrosion resistance and impermeability to moisture of 18-8 No. 302 Stainless steel is said to be offered by Liquid Stainless Steel. Metal is present in microscopically fine flakes which overlap and interlock as the coating dries. The material is applied by spraying, brushing, or dipping. Thorough surface preparation is recommended for best results. Color is bluish grey, non-shiny.

The Lockrey-Fater Corp. 401 Broadway, New York 13, N. Y.

How to save *most* in assembly

SKIPS TAPPING, AVOIDS INSERTS, MAKES STRONGER FASTENINGS

Timely Toys, Inc. chose P-K Type Z Self-tapping Screws to fasten the metal base plate and mechanism to the polystyrene shell of this popular Turnabout toy car. Screws are driven rapidly with a power driver, and the strong, rigid fastening withstands shock and abuse. Manufacturer says, "No other method would give us the production speed wanted without breakage." Find out how you can make similar savings in time, avoid breakage, and add strength.

Choose the "*short cut*" fastening method

When you make fastenings with Self-tapping Screws, you simply drive them in plain, untapped holes. You avoid tapping for machine screws, inserts in plastics and other assembly-slowing operations like nut-running and riveting. Stripped threads, tap breakage, and parts spoilage are no longer a problem, and your assembly is stronger. But choosing this common sense *method* is only the first step.

TYPE Z
(also made with Phillips Head)

Let P-K* fit the fastener to the job

Only Parker-Kalon offers a complete line of Self-tapping Screws. P-K fits the right fastener to your needs, not your needs to a fastener. Another reason why P-K can help you save most is their 35 year experience as Self-tapping Screw specialists. P-K applications number more than a million, many with savings up to 50% and over.

Find out what you can save. Call in a P-K Assembly Engineer, or send assembly details for recommendation.

Remember, the actual cost of screws depends, never on price, *always* on performance. Specify P-K Self-tapping Screws, and you'll see why the makers of so many of the nation's best-known products say—IF IT'S P-K . . . IT'S O. K.!

Parker-Kalon Corporation, 200 Varick St., New York 14, N. Y. Sold everywhere through accredited Distributors.

NEED SPECIAL SMALL SIZE PHILLIPS HEAD SCREWS?

P-K Type A or Z, in No. 0 or 00 diameter, with a No. 0 Phillips Recess, can be made to order, quantity permitting.

*Trade Marks Reg. U. S. Pat. Off.

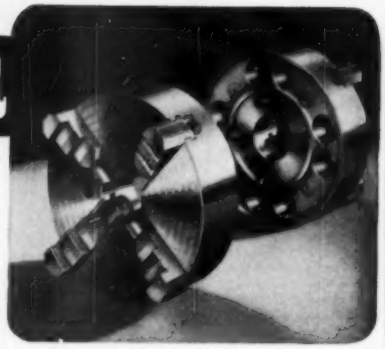
P-K
TRADE MARK

The Original
PARKER-KALON* SELF-TAPPING SCREWS

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY

SKINNER

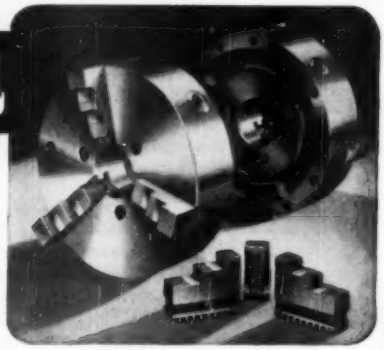
INDEPENDENT CHUCKS



Models for medium and heavy duty tool room and general machine shop work. Available in sizes from 4½" to 36" with semi-steel, steel, or forged steel bodies. All other parts are heat-treated alloy steel. Jaws are solid reversible or two-piece with reversible tops for either internal or external gripping. The body surrounds more than 60% of each operating screw for the full length of the screw to assure proper alignment at all times.

SKINNER

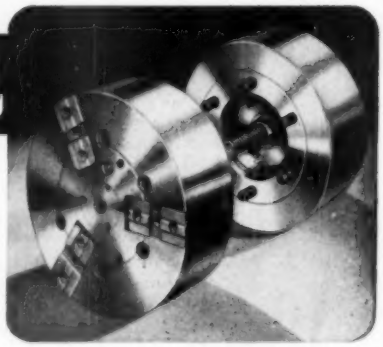
SCROLL CHUCKS



Self-centering models for light, medium and heavy duty jobs in tool room or for production runs. Available in sizes from 3" to 21" with semi-steel or forged steel bodies, and heat-treated alloy steel for all other parts. Provided with two sets of solid jaws or two-piece jaws for holding internal or external work. Lands on the jaw, jaw steps and end bites are ground after the chuck is assembled.

SKINNER

POWER CHUCKS



Self-centering models for heavy duty production work on engine and turret lathes and automatic machines. Sizes from 6" to 21" with forged steel bodies, and with either 2 or 3 non-adjustable jaws are available. The wedge angle is such that work is gripped positively regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates draw bar. Skinner also has a complete line of power chucking accessories.

THE SKINNER CHUCK COMPANY

Hand and Power Operated Machine Chucks—Air Chuck Equipment—Face Plate Jaws—Machine Vises—Complete details in free Catalog No. 61.

SKINNER CHUCKS

THE CREST OF QUALITY

346 Church Street
New Britain
Connecticut

Shatterproof Hacksaw Blade Has High Flexibility

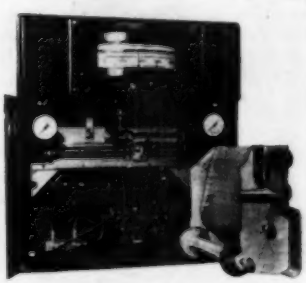
Subjected to a special heat-treatment, the Star Molyflex hacksaw blade is said to combine extreme flexibility plus high cutting qualities. Blades are available in all hand sizes and pitches with specifications clearly printed on them.

Clemson Bros. Inc., Middletown, N. Y.

Quick-Change Type Holder For Light-Duty Marking

The Model 22 alloy-steel type holder is for light-duty marking in brass, aluminum, or cold-rolled steel and can accommodate all sizes of characters up to 5/32 in. high. Type is notched and a hooked rod holds it in place. Type cannot be inserted the wrong way and can be changed rapidly by simple hook removal.

Numberall Stamp and Tool Co., Hugenot Park, Staten Island 12, N. Y.

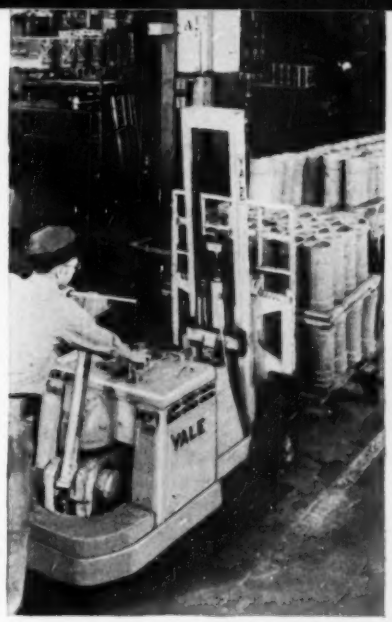


Strip Chart Recorder Is Air Operated Unit

Temperature, speed, flow pressure, static grain loads, ac or dc volts and current are among the values which can be measured and recorded on the Wheelco Capacilog electrical system. The control function is performed by air power operating dia-

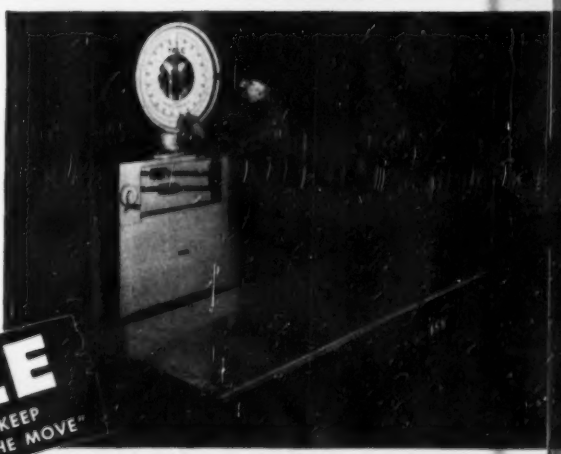
GIVING COSTS THE

economy treatment...



The economy treatment—that's what handling costs are getting in more and more plants. It's high time, too, because it is estimated that unskilled workers still devote 80% of their time to moving materials. And when you also consider that at least 30¢ out of every production dollar is paid out to lift, transport and stack goods, you have plenty of reasons why the cost of material handling needs a good going over.

Thousands of large and small plants are already putting a big dent in handling costs by using Yale Hoists, Trucks and Scales. You can have the same economy now. Let us give you the benefit of our long and varied experience in solving material handling problems. Our recommended "economy treatment" will lead you to efficiency, speed, safety and lower costs. Phone or write today.



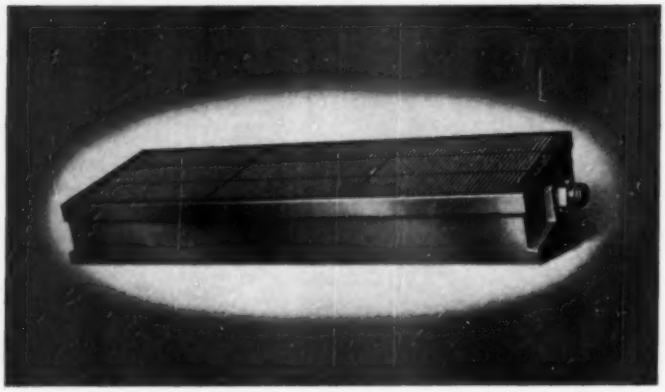
THE YALE & TOWNE MANUFACTURING COMPANY
Department L-103
Roosevelt Boulevard Philadelphia 15, Pa

YALE
TOOLS THAT KEEP INDUSTRY "ON THE MOVE"

YALE

MATERIAL HANDLING MACHINERY · *hoists — hand and electric · trucks — hand lift and power · industrial dial scales*

And Now—Walker Chucks Hold Non-Ferrous Metals



Now you can hold brass, copper, aluminum, glass. The new Walker Vacuum Chuck has proven its acceptance. This development is Walker's response to the requirement of the airplane, glass and other industries using other than magnetic materials.

For fast service to meet your own requirements, Walker Engineers are ready for your call. Telephone Worcester 6-6293.

The Original Designers and Builders of Magnetic Chucks

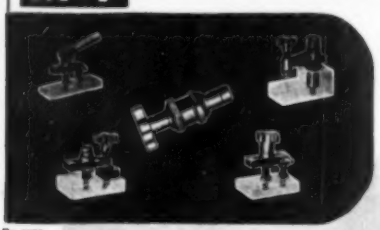
Hold Everything! with Walker Chucks

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

M-T FIXTURE CLAMPS AND COMPONENTS



BE DOUBLY SURE with M-T QUALITY

FIXTURE CLAMPS—wide range of sizes and types to fit every requirement. JACK LOCKS . . . Cam Locks . . . Hand Knobs . . . Hand Wheels . . . Steel Ball Handles . . . Soft Chuck Jaw Blanks . . . Fixture Cams . . . Alloy Set-up Studs . . . Rest Buttons and Rest Pads . . . Spherical and Plain Collar Nuts . . . Quarter Turn Screws . . . Fixture Keys . . . Spherical and Flat Washers . . . Shoulder Screws and many other items from stock.

Write for Complete Catalog.

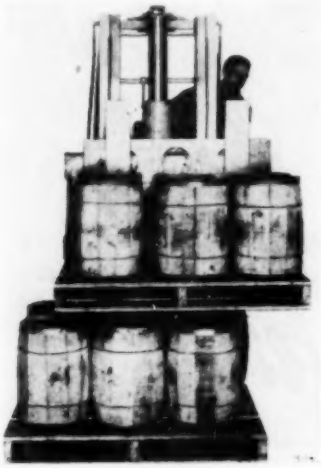
Be sure to visit our Exhibit April 10-14 at Philadelphia Show.

MORTON MACHINE WORKS

2421 WOLCOTT ST. FERNDALE 20, MICH.

phragm motors connected to valves, dampers, levers, or pistons. The unit is completely self-contained and has only two external air connections.

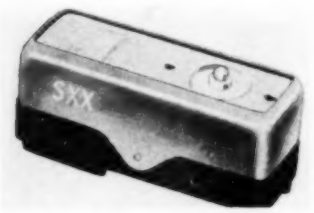
Wheelco Instrument Co., 847 W. Harrison St., Chicago 7, Ill.



Fork Truck Built With Side-Shifter Attachment

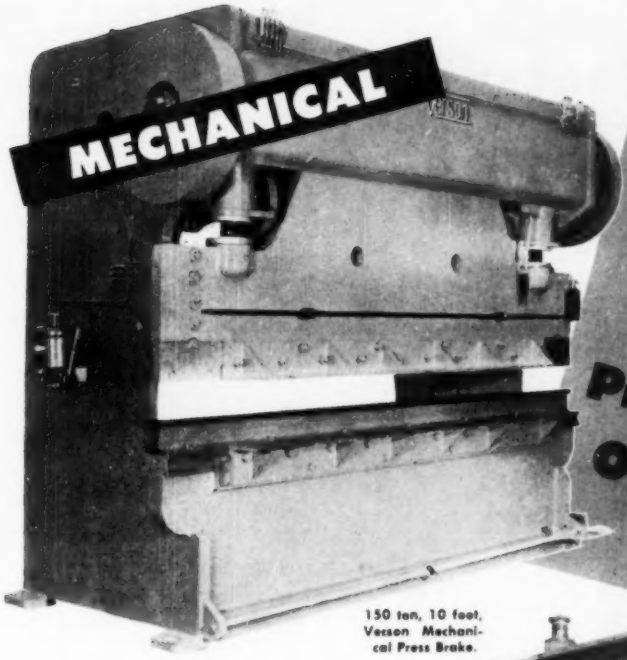
Hydraulically operated side-shifter attachment for the Lift King and Work Saver fork trucks, shifts the forks as much as four in. to the right or left of center. This facilitates spot loading in odd corners, close to walls, near pillars, or in any confined transfer and storage areas. The side shifter is said to be easily removed to permit installation of other accessories on the lift trucks.

The Yale & Towne Mfg. Co., Roosevelt Blvd. and Haldeman Ave., Philadelphia, 15, Pa.



Snap-Acting Precision Switch Handles 20 Amps at 125 V

Type SXX Unimax precision switch is rated at 15 amps, 250 v ac; 20 amps, 120 v ac; ¾ hp, 125, 250, 460 v ac. It can be adapted for leaf, leaf-roller, hinged, plunger, push-on, push-off, and other actuating means by attachment of standard Unimax Adaptaplates. Force and movement specifications include operating force,

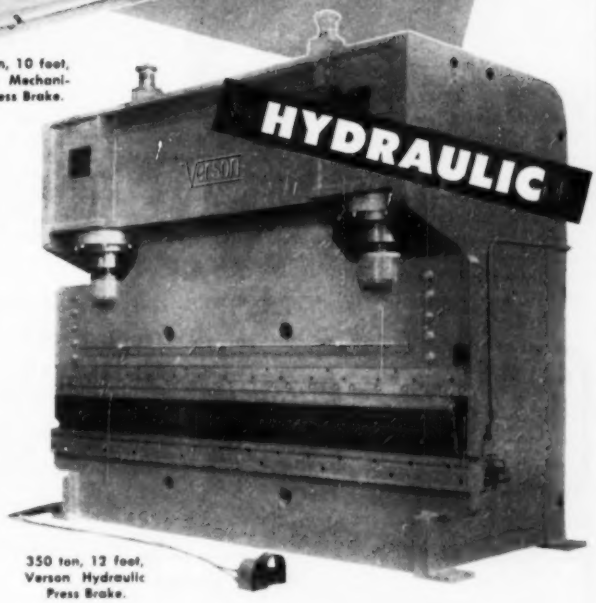


150 ton, 10 foot, Verson Mechanical Press Brake.

—Verson— Gives You a Choice in Press Brake Operation

As a manufacturer of both mechanical and hydraulic press brakes Verson can appraise your press brake requirements without prejudice—and recommend the method of operation best suited to your needs. All Verson Press Brakes, regardless of method of operation, offer outstanding design and construction that make them the leaders. From the small 16-48 brake to the heavy Majors, Verson Press Brakes are built to do their jobs better, faster and more economically.

If you have a job involving the forming, bending, coping, punching or notching of metal, we would welcome the opportunity to go over your requirements with you. Literature describing Verson Junior, Intermediate, and Major Press Brakes and Verson's complete line of press brake dies and punching attachments is available. Write for copies of those in which you are interested.



350 ton, 12 foot, Verson Hydraulic Press Brake.

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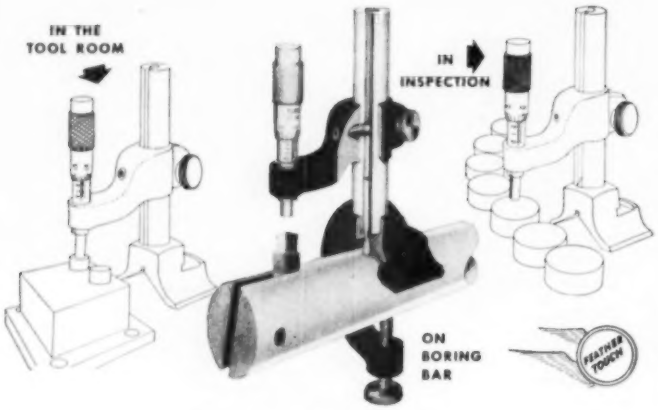
3-minute set-up

On any boring bar up to 5"... or on any surface plate ... with the versatile

Tumico Post Gage



This convenient Post Gage can be set up anywhere in 3 minutes or less. It is instantly adjustable from 0 to 4", for setting cutting tools in boring bars, or for measuring from any surface plate. Set-up is made by inserting setting standards in the hollow post. Pictures above show ingeniously designed base, which permits use of clamps in three sizes for securing the base on boring bars up to 5". The post will swing so that measurement can be taken on either side of the base without changing the measurement reading or the clamped position. This gage takes the guess work out of tool setting and readily adapts itself to many other tool room and inspection functions.

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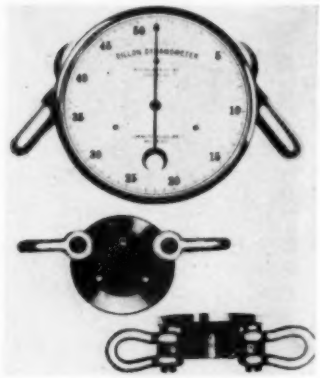
9-13 oz; release force, 4 oz min; movement differential, 0.005 in. max, pre-travel, 0.025 in. max; and over-travel 0.005 in. max.

W. L. Maxson Corp., 460 W. 34th St., New York 1, N. Y.



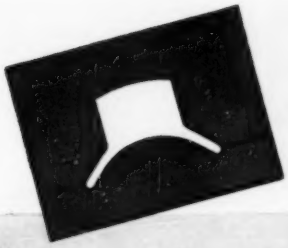
Traction Dynamometers Check Tension Loads to 50,000 Lb.

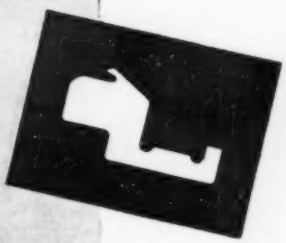
High-capacity dynamometers check drawbar pull, weight of bulky objects, or tension in ropes or cables for static loads. Available in 30,000-, 40,000-, and 50,000-lb capacities, they are equipped with 10-in. dials with etched figures and a satin-silver finish which is not affected by heat or fumes. Dial divisions for the two smaller-capacity units are 200 lb and for the larger, 250 lb. The unit weighs 25 lb including shackles.

W. C. Dillon & Co Inc., 5410 West Harrison St., Chicago 44, Ill.

Manual Motor Starter Provides Positive Overload Protection

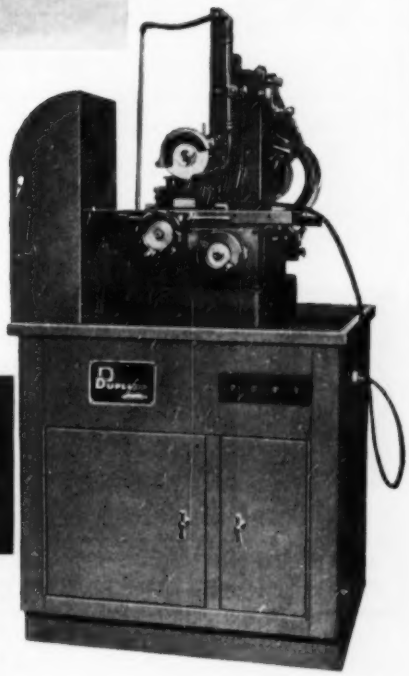
Said to be especially suited for controlling and protecting small motors for fans, pumps, small machine tools, grinders, and stokers, the Motor Sentinel fits any standard 2½-in. wall box. With a front-removable heater of the proper rating, the Motor Sentinel permits time delay for starting





If you have difficult form grinding problems

DUPLIform TRADEMARK is the answer...



Bring your FORM GRINDING problems with samples to BOOTH 1122, A·S·T·E EXPOSITION
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The **DUPLIform**, a Profile Surface Grinder, especially designed for tool making and small parts grinding, incorporates a Profiling Wheel Dresser which permits dressing of the wheel directly from a sample part when grinding either male or female portions of the die, tool or gage. It is inherently more accurate because it includes a means of correcting the form of the profile follower to correspond exactly with the contour of the diamond point, regardless of its shape or variation from symmetry. This compensation of the tracer nose can be repeated as often as necessary in the processing of the tool to final size. This feature also greatly prolongs the usable life of the diamond. Punches can be economically ground to maintain precise clearances by using the die section as a master and vice versa.

Rigid construction, as well as hardened and ground ways, insures tenth splitting accuracy and permits this machine to be used for heavy roughing cuts.

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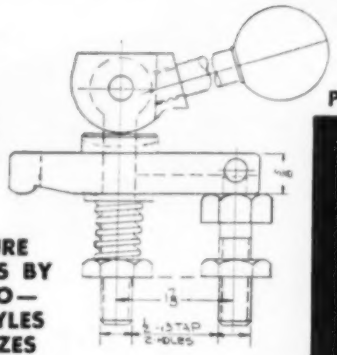
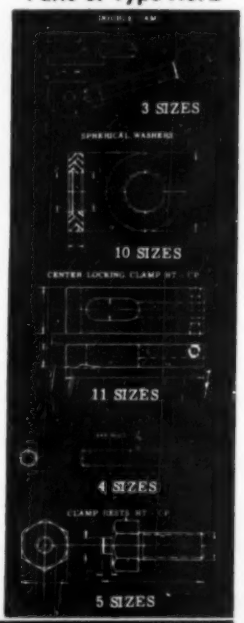


WESPO TYPE NO. 2, CLAMP ASSEMBLY

Below shows Parts of Type No. 2



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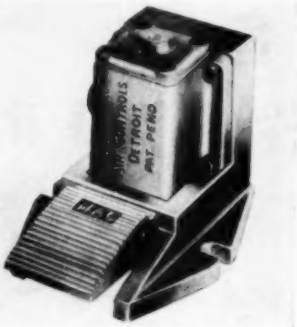
and allows the motors to carry overloads up to their safe capacity without disconnecting them from the line. Special cast-iron inclosures are available for water-tight and explosion-proof applications.

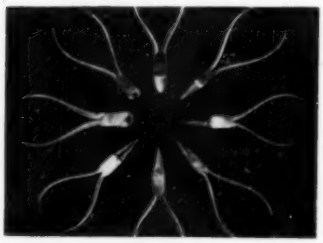
Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.



Foot Valves Control Single-, Double-Acting Cylinders

Mac foot valves are available in ⅜- and ¾-in. sizes in either locking or non-locking units. The treadle is designed to provide shortness and ease of stroke, and locking is obtained by slight forward pressure of the toe when the pedal is depressed. Downward pressure of the toe releases the locking mechanism. Body design includes one moving part, a hard-chrome spool, on which is mounted Mac "O" ring seals.

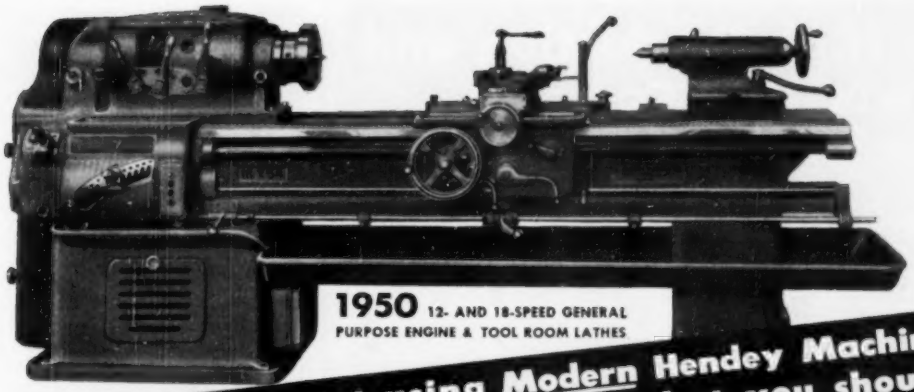
Mechanical Air Controls Inc., 3049 E. Grand Blvd., Detroit 2, Mich.



Wide Variety Available in Swedish Plier Line

Vigor pliers are made of Swedish steel, forged and hand machined to produce high-precision instruments. The flat-, chain- and round-nose pliers as well as end and side cutters are included in the line. Flat- and chain-nose pliers are available with both smooth or corrugated jaw faces. The end and side cutters are ground to a sharp-biting cutting edge to cut cleanly with a minimum of hand pressure.

B. Jadaw, Inc., 860 Broadway, New York, N. Y.

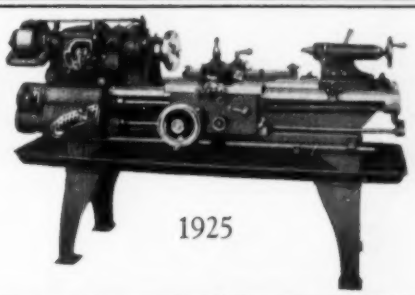


1950 12- AND 18-SPEED GENERAL PURPOSE ENGINE & TOOL ROOM LATHES

. . . If you are not using Modern Hendey Machines you are not earning the profits that you should!

Hendey Engine and Tool Room Lathes have been, and always will be, tops for accuracy. But, are you aware of the many other modern features of the new Hendey line? Like all Hendey Lathes, the 12- and 18-speed now have induction hardened and precision ground bed ways for both carriage and tailstock. Every important unit has fully automatic lubrication. The rear end of the spindle is graduated for indexing when cutting multiple threads, and there are 36 thread and feed changes. The precision, all-geared headstock is powered from a built-in motor in the cabinet leg. Spindle speed ranges from 19-1000 R.P.M. A choice of cam lock or long taper key drive spindle noses. Modern Hendey Tool Room Lathes are available with swings of 9", 12", 14", 16", 18", 20" and 24". Write today for full details and complete specifications.

This 8-speed Hendey Engine Lathe has long been obsoleted by the all-new Hendey 12- and 18-speed lathes. The 8-speed bed is not hardened and precision ground. Maximum spindle speed is only 426 R.P.M. Although a masterpiece of design and construction in its day, the 8-speed has been replaced by progressive manufacturers, because the 12- and 18-speed offer every modern improvement necessary to earn maximum profits.



1925

Continuous, advanced engineering by Hendey is worth watching — and must be watched if you are to earn full profits from your lathes and shapers. For complete particulars and prices, contact your nearest Hendey office.

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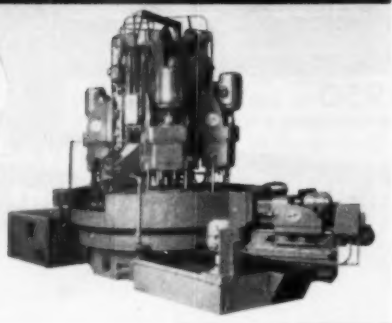

Here's a good example of the application of standard machine units to a special production job. Drilling and reaming operations of suspension support holes are performed on both right-hand and left-hand parts simultaneously. Drilling and reaming king pin holes is also included. Six stations, five operating and one loading, handle all operations with a total of 16 spindles. Machines of this type can be furnished from standard basic units for special applications on most all metalworking operations.

For Combined Operations or Single Purpose Machines

Machines similar to this can be designed to handle dissimilar operations in the same parts or one operation on continuous production. An indexing table with ROTO-MATIC POWER HEADS is easily arranged to suit special machining operations.

Lower Maintenance Costs with ROTO-MATIC Mechanical Power Heads

This machine is a good representative of the applications of D. & T. Roto-matic mechanical power heads. Six heads are used, three vertical and three horizontal. These new power heads lower maintenance costs through elimination of excessive servicing.

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SHOW IN PRINT *continued*

Stub-Boring Tool Sets Cover Range From 1¼- to 7-In. Dia

Assembled primarily for the company's horizontal boring, drilling, and milling machines, the Davis Super micrometer stub-boring tool sets contain seven tools which cover a boring range from 1¼- to 7-in. dia. They also include an offset boring head for small pencil boring, light extended boring up to 13-in. dia, and for facing operations. Each set has reducing sleeves, adjustable stop-jacks, and T-slot parallel blocks.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. **Booth 230**

Hydraulic Unit Controls Cutting-Tool Feed Rate

Model HC Hydro-Check is designed to control the feeding rate of air-fed cutting tools. It applies a controlled hydraulic resistance to the piston travel of an air cylinder, smoothing out natural bounce and springiness of air. It provides a maximum checking load of 12,000 lb, infinitely variable through a precision adjusting control. Standard models apply resistance in one direction only, permitting full control over the cutting stroke, but allowing rapid return of the tool to starting position. Double-acting Hydro-Checks which exert resistance in both directions are also available.

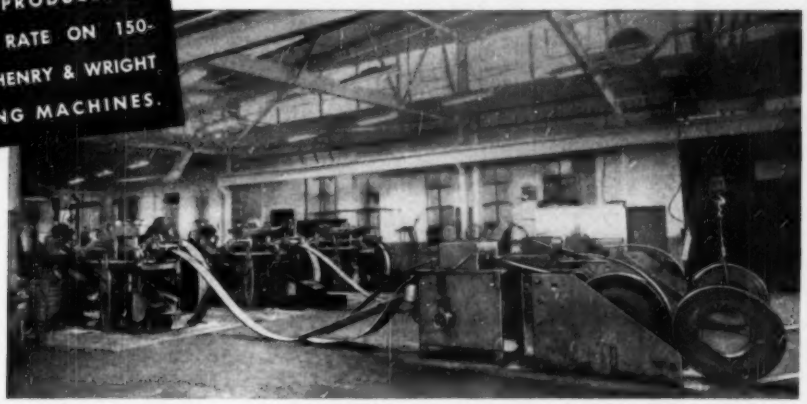
The Bellows Co., 222 W. Market, Akron, Ohio **Booth 802**

Profile Surface Grinder for Tool Making, Small-Parts Work

The Dupliform surface grinder incorporates a profiling wheel dresser which permits dressing of the wheel directly from a sample part when grinding either male or female portions of a die, tool, or gage. It is said to be inherently more accurate because it includes a means of correct-

MINIMUM INVESTMENT ← → OPTIMUM PERFORMANCE

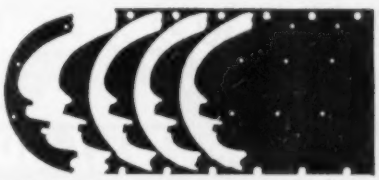
BRAKE STAMPINGS OUT OF 3/16" HOT ROLLED STEEL PRODUCED AT HIGH RATE ON 150-TON HENRY & WRIGHT DIEING MACHINES.



Kelsey-Hayes uses a battery of three 150-ton Henry & Wright Dieing Machines operating in conjuction with H & W Automatic Power Straighteners and H & W Cradle Reels.

Kelsey-Hayes Wheel Company, in its Jackson, Mich., plant is producing automobile brake components out of hot rolled steel up to 3/16" thick in excess of 100 strokes per minute. A tough and challenging assignment for progressive stamping, but taken in stride by the sturdy precision of Henry & Wright Dieing Machines.

There are presses that operate at high speed — but have a poor die life. There are others that give good die life — but operate at low speed. Only Henry & Wright Dieing Machines give you both high speed and long die life — a double feature that assures lowest cost production of stampings, with a minimum investment.



Brake shoe webs are stamped out in five steps — a typical example of complete-per-stroke production on H & W machines.

Complete-per-stroke production shoots out these rear brake emergency levers at high speed in six steps. Note operations performed.

Henry & Wright Dieing Machines do the work of 3 or more ordinary presses. Get more details by writing for our catalog.

HENRY & WRIGHT
DIVISION OF HARTFORD-EMPIRE COMPANY

480 Windsor St., Hartford 1, Conn.

Here are six of the many ways in which NELCO Carbide-tipped Cutting Tools are meeting to-day's requirements for faster production at lowered costs. Several are exclusive with NELCO.

1. HEAVIER CARBIDE TIPS ON STEEL BODIES . . . Stay sharp longer, allow greater feeds, assure more regrinds, cut maintenance costs.

2. STRESS RELIEVED . . . NELCO slash-milled design and single surface brazing eliminate grinding cracks and costly tool replacement.

3. SANDWICH BRAZED . . . NELCO cutters have a shim of nickel or other metal sandwich-brazed between the tool body and the tip to eliminate brazing strains.

4. GREATER CHIP ROOM . . . Prevents clogging and decreases the chance for work overheating. Allows free flow of chips. Less power consumption.

5. TRI-HELIX TOOTH DESIGN . . . NELCO Side Milling Cutters for alloy steel have the exclusive Tri-Helix cutting face which holds the width and stays sharp longer and eliminates chipping.

6. NELCO milling cutters are copper plated for steel and steel alloy jobs; cadmium plated for non-ferrous, cast iron and plastic materials, preventing mix-ups and misuse of tools.

NELCO Standard Tools are shipped promptly from stock. Those made to order are subject to quotation which will be sent promptly upon receipt of your prints and specifications.

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Only reliable products can be continuously advertised.

ing the form of the profile follower to correspond with the contour of the diamond point regardless of its shape or variations from symmetry. The compensation of the tracer nose can be repeated as often as necessary during processing of the tool to final size. Punches can be ground to maintain precise clearances by using the die section as a master and vice versa.

Airborne Accessories Corp., 25 Montgomery St., Hillside 5, N. J. **Booth 1122**

Profile-Grinding Attachment Added to Universal Tool Grinder

Mounting of this optical profile-grinding unit on the Nife US-21 grinder requires approximately ten minutes and makes both a tool grinder and a profile grinder available in one machine. The unit consists of a projector, a screen, a special workholder, and a motor which drives the table in mounts available from ¼ to 1 in. Standard magnification is approximately 10 X but others are available. Resulting accuracy of the magnified part is approximately 0.01 mm. Errors caused by wear of the wheels, distortion of the machine parts, or free movement between parts are eliminated. The time and expense of making templets are also eliminated.

Nife Inc., 165 Broadway, New York 6, N. Y. **Booth 12**

Work-Holding Air Clamp Complete With Spring Return

The Schrader air clamp is a small push-power air cylinder, incorporating spring returns. It is said to provide an extremely fast and useful means of clamping work in position. The unit is available in either base-mounted or leg-mounted models, with strokes from 1 to 2 in. and 1-, 2¼-, and 3-in. cylinder diameters.

Also available is a new series of single- and double-acting cylinders in diameters up to 8 in. in any stroke, and with bolt, flush, leg, and base mounting.

A. Schrader's Son, Div. of Scovill Manufacturing Co., Inc., Brooklyn 17, N. Y. **Booth 752**

The New HALLOWELL "700" Steel Platform Trucks

All-steel body eliminates excess weight, permits heavier loads per truck.

Heavy-duty construction lengthens truck life, reduces maintenance costs to the vanishing point.

New, functional design increases strength, provides better load distribution, makes handling easier.

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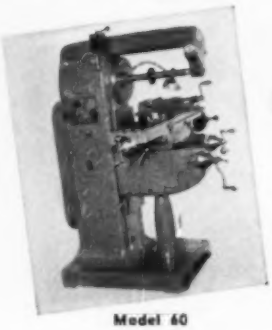
Model 55



Model 60

IDEAL FOR THE TOOL ROOM—EXCELLENT FOR LIGHT PRODUCTION—

Model 55 IMPROVED VERTICAL MILL. A speed range of 80 to 2700 RPM's combines with a 1 H.P. drive, 3¼" quill, and extra rugged spindle mounted on over-size precision ball bearings to give a capacity of ⅛" to 1½" end mills in steel. Spindle quill travel is 5¼" either by lever, hand wheel, or power, and has adjustable positive stop and automatic safety throw-out. Table 40" x 9" or larger. Longitudinal table power feed has 8 geared feed changes.

Model 60 PLAIN HORIZONTAL MILL. A full No. 1, that in many ways equals or exceeds a light No. 2 in capacity. Low maintenance due to all rapidly moving parts running in oil, hardened alloy gear train, and fully ground alloy steel spindle mounted on pre-loaded precision ball bearings requiring no adjustment. Standard table 40" x 9" overall, with larger table optional, is supported by 18" of saddle bearing, and has accurately ground lead screws for transverse and longitudinal movement. Constant flow coolant system of 8 gallon capacity starts and stops with spindle.

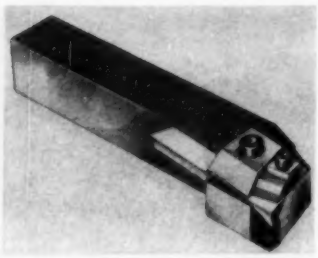
Write for Literature

Visit Our Booth 1115, A.S.T.E. Show, Philadelphia, April 10-14

INDEX MACHINE CO.

547 N. MECHANIC STREET JACKSON, MICHIGAN

Study this issue to select the exhibits at the A.S.T.E. Show of the greatest interest to you.



Carbide Turning Tool Uses Triangular Toolbits

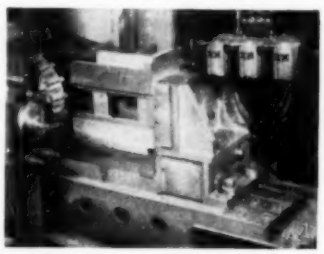
Equipped with mechanical chip breakers, adjustable to on-the-job conditions, this tool is said to eliminate costly grinding operations and set-up time necessary to provide chip breakers in the brazed-on tool. The carbide holder always remains intact and only the toolbit is ground when sharpening. All leading brands of carbide are available for the triangular-shape solid-carbide toolbits.

Everede Tool Co., 2000 N. Parkside Ave., Chicago 39, Ill. **Booth 311**

Press Provides 85-ton Capacity, Unicast Semi-Steel Construction

Model 85 Press-Rite power press embodies an extra-heavy-duty bar reinforced unicast frame of semi-steel construction. The bars are said to provide a safety factor much higher than the rated capacity of 85 tons.

Sales Service Machine Tool Company, 2363 University Avenue, St. Paul, Minn. **Booth 902**



Magnetic Workholding Fixture For General-Purpose Milling

The Power-grip magnetic chuck is for keyway milling, die-block milling, form grinding, and diversified toolroom work. It is a complete unit with Viking chucks mounted on an adjustable fixture. Chucks are said to be easily and quickly adjusted to size of work and can be positioned at any angle from 0 to 90° for milling cuts. For miscellaneous milling jobs, requiring frequent changes, this unit eliminates time losses in

HAYNES STELLITE 98M2 TOOLS

Trade-Mark

have ... red hardness
... increased edge strength
... toughness

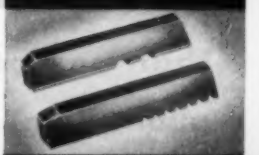
SQUARE TOOL BITS

RECTANGULAR TOOL BITS

ROUND TOOL BITS

TIPPED TOOLS

TOOL TIPS



INSERT MILLING CUTTER BLADES

HAYNES STELLITE 98M2 tools are especially suitable for faster production machining of ferrous and non-ferrous metals, plastics, and wood. In addition to the standard tools illustrated, special tools, made to your specifications can be promptly furnished.

98M2 alloy—composed of cobalt, chromium, and tungsten—is inherently hard. And since its hardness is not the result of heat treatment, tools made of this alloy have no "temper" to be affected by high temperatures. They cut efficiently even at red heat, and have a good balance of hardness, edge-strength and toughness. This unusual combination of properties makes possible heavy cuts and coarse feeds at high speeds. This high rate of stock removal assures a low cost per piece machined.

For complete information on styles, sizes, prices, and operating procedures for HAYNES STELLITE cutting tools, visit our exhibit in Area 509, Tool Engineers' Industrial Exposition, April 10-14, Convention Hall, Philadelphia.

HAYNES
TRADE-MARK
alloys

Haynes Stellite Division
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices: Chicago — Cleveland — Detroit — Houston — Los Angeles — New York — San Francisco — Tulsa

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

NEW tapping head SLASHES COSTS on large hole tap jobs!

★ Production increased as much as 100%

★ Drastic reduction in spoilage

★ Greatly increased tap life

This completely new Procunier "TAP KING" high speed tap head is revolutionizing methods . . . drastically *cutting production costs* on difficult large hole tapping jobs. Spectacular daily *production gains* with this new unit have *run as high as 50-100%!* In addition, users reported amazing savings in parts spoilage and consistent, accurate maintenance of uniform tap depth . . . even on large *blind hole* tapping jobs!

Construction features include: capacity ⅜" to 1" in steel and 1½" in softer materials; powerful friction clutch; exclusive spline drive to tap holder spindle; ball and needle bearings; rigid, lightweight "TRU-GRIP" tap holder; helical back gear reversing mechanism; lightweight aluminum housing and many other unusual advantages.

Here is the answer to your toughest large hole tap problems . . . write for full details today!

FIRST SHOWING — BOOTH 611 — ASTE SHOW—PHILADELPHIA—APRIL 10-14

PROCUNIER SAFETY CHUCK CO., Dept. 4
14-18 S. Clinton St., Chicago 6, Ill.

Gentlemen:

Please send me full details on the new Procunier "TAP KING."

Name _____

Address _____

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NEW!
LARGER! Procunier "TRU-GRIP" Tap Saver

Small size makes tapping easier close to walls or shoulders, eliminates "chewed" tap shanks. Lighter, smaller in diameter it drives the tap by the square, holds it true by the round.

Procunier
Safety Chuck Company
14-18 S. Clinton St., Chicago 6, Illinois

More men pay to read

American Machinist

than any other metalworking publication – by many thousands

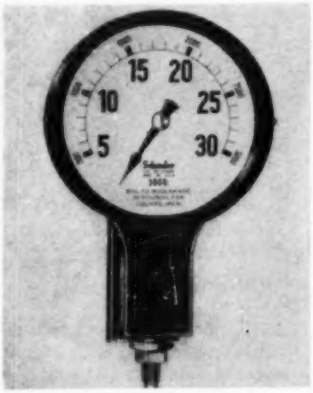
adjusting mechanical clamps. Fixture shown is set up to hold a part for eight different milling cuts.

Sundstrand Machine Tool Co., Rockford, Ill. **Booth 907**

Clear Coolant Allows Better Vision of Tool

Lusol coolant is said to make possible great increases in both tool life and machining speeds as well as providing cooler work and finer finish. A clear solution, it allows a good vision of the tool. Lusol is water-soluble, and causes no skin irritation.

F. E. Anderson Oil Co., Portland, Conn. **Booth 422**



Gage Built on Direct-Acting, Shock-Resisting Principle

The Schrader Hydrodial gage has a circular dial, readable at 50 ft, and is provided with built-in snubber and plastic face. Built on a direct-acting shock-resisting principle, the gage withstands heavy overloads.

A. Schrader's Son, Div. of Scovill Manufacturing Co., Inc., Brooklyn 17, N. Y. **Booth 752**

Piston-Rod Speed Control Built Into Bellows Air Motor

Air Motor Model BM2 has 1¾-in bore and develops a thrust of approximately twice the applied airline pressure. It is available with either a built-in manually controlled air valve, or a built-in electrically controlled air valve. Speed controls for regulation of piston-rod speed in

HOW YOU PROFIT BY *Centrifuging* FACTORY OILS...

KIND OF OIL	DE LAVAL CENTRIFUGAL OIL PURIFIER removes	RESULT
CUTTING OIL	Grit Metallic Particles Water	Oil can safely be re-used indefinitely Less dermatitis Increases tool life
DRAWING OIL	Scale Metallic Particles	Saves wear on dies
GRINDING COOLANT	Abrasive Particles Metallic Particles	Saves wheel dressing time Better finishes in less time Likelihood of distorting work decreased
HONING OIL	Abrasive Particles Metallic Particles	Reduces rejects Insures mirrorlike finish
HYDRAULIC OIL BALER OIL	Condensate Solid Impurities	Eliminates rust Saves pumps and control mechanisms Valve sticking minimized Prevents hardening of leather seals
RUN-IN TEST OIL	Metallic Particles Core Sand	Tests are more reliable Oil can be re-used indefinitely with perfect safety
QUENCHING OIL	Scale and Dirt Carbon Water	Increases oil life Eliminates "soft-spots" due to moisture
SHOCK ABSORBER OIL	Metallic Particles Dirt Solid Impurities	Prevents particles causing piston wear Assures correct cushion
SLUSHING COMPOUND	Dirt Dust	Rust-preventing compound can give full measure of protection
WASHING OIL	Metallic Particles Dust Dirt	Prevents work being scored

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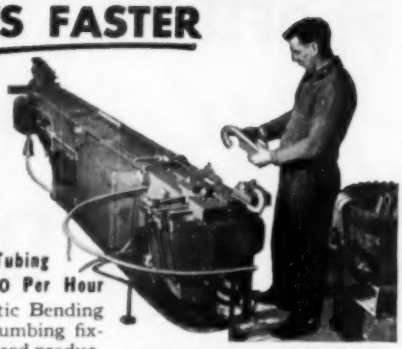
SINK DRAIN-TRAP BENDS PRODUCED

2½ TIMES FASTER

WITH **PINES**
Automatic
BENDING MACHINE



180° Bends in 1½" Brass Tubing Produced at Rate of 400-500 Per Hour

This Pines Size ¾ Automatic Bending Machine, employed by a plumbing fixture manufacturer, has increased production of sink drain traps 250% over former methods, and reduced tool maintenance costs 50%. Between 400 and 500 180-degree bends per hour are produced in 1½" brass tubing of .032" wall. The radius of the bend to center line is 1⅝". Prior production was less than 170 bends per hour.

Angle of Bend Held to ½ Degree

In addition, an exclusive Pines-built mandrel with four ball segments assures accurate results. Roundness of the tubing is held to a ±.005". Accuracy of the bend is maintained to ½ of one degree.

COST-SAVING FEATURES

- Produces Accurate, Uniform Bends without wrinkles or distortion.
- Faster operating—saves time, cuts costs.
- Pushbutton Control—easy for one man to operate.
- Highly Versatile—handles wide variety of work including serpentine, stacked coil, compound, and multiple bends.
- Readily Adaptable to round, rectangular, and square tubing, bars, rolled or extruded sections.
- Superior Design—heavy cast-steel nose, alloy steel spindle, adjustable gibs, Timken bearings—assures longer operating accuracy, less maintenance.

Write for Free Literature

Learn how Pines production bending equipment can help you save time and cut costs. Ask Pines engineers to submit recommendations.

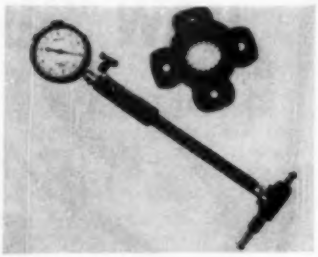
PINES ENGINEERING CO., Inc.
Specialists in Tube Fabricating Equipment
672 WALNUT AURORA, ILLINOIS

SEE PRODUCTION BENDING OPERATIONS AT ASTE SHOW BOOTH 1168

If you can't attend the A.S.T.E. Exposition, this issue describes most of the new equipment to be exhibited there.

either or both directions are an integral part of both valves. The air motor is available in almost any required stroke length.

The Bellows Co., Akron, O. **Booth 802**



Dial Bore Gage Converted Into Internal Spline Gage

By removing the centralizing unit, which is not an integral part of the gage, the standard Nilco dial bore gage can be converted into an internal spline gage. The gaging pin and range extension are then faced with appropriate-dia carbide rolls or balls. Rolls can be used for checking a spline without necessity of rocking the gage. For taper checking, balls are used and gage is rocked.

Nilsson Gage Co., Inc., 2A Lake St., Poughkeepsie, N. Y. **Booth 1151**

Cutoff, Sanding Wheels Provide High Durability

Norflex cutoff and sanding wheels, of reinforced constructions, are said to both provide fast cutting and to be virtually unbreakable. The cutoff wheel is used on dry operations for removing sprues, gates, and risers from non-ferrous castings, light snagging, cleaning cast-iron gear teeth, and track-weld slotting.

The raised-hub Norflex portable-grinder sanding wheel is for grinding down welds, cleaning and smoothing machine castings, and for reaching into corners and hard-to-get-at-places, among other applications.

Norton Co., 1 New Bond St., Worcester, 6, Mass. **Booth 409**

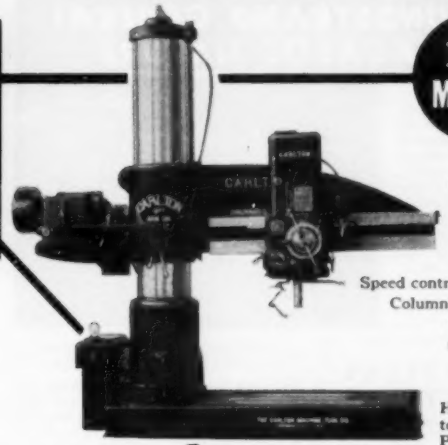
Steel-Bonded Diamond Wheel Grinds Chip-Breaker Grooves

A special steel bond is reported to give this wheel extra long life, eliminate wheel dressing, and to permit three to four times faster grinding. Chip-breaker grooves from 0.02 to 0.04 in. deep are ground in one pass. When the cut is completed, one re-

CASH IN ON CARLTON PROGRESS

Comparison of CARLTON RADIAL DRILLS

1929 MODEL



WGT: 22,000 lbs.

Soft spindle.
Ball Bearings.
Speed control levers on back of Arm.
Column clamp mounted on Base.
Gears, shafts and spindle machined from bar stock.

1949 MODEL

WGT: 26,000 lbs.

Hand operated clamping to Head and Arm.
Power clamping to Column.
Lever operated Arm elevating controls.
Hand lubrication to Column.
4 levers to control 48 spindle speeds through speed box mounted on arm.
Spindle speed reference chart.
Friction feed clutch.

Mechanical Advantages

Ground teeth, hardened gears with wider faces.
Hardened spindle.
Ball and roller bearings.
All speeds in Head controlled by two levers.
Column clamp mounted in Arm.
All parts, wherever possible, are machined from drop and hammered forgings.

Heavier Arm, Base and Column for greater rigidity in 1949 models. Independent motor driven operating units are built into machine, mounted in fully enclosed cabinets, and easily accessible to the operator and maintenance man.

Maintenance Advantages

Every part is jig machined to absolute interchangeability of parts.
Entire machine is assembled on the unit principle.
Only one friction clutch unit to adjust.
Simple electric circuits to all motors.
Easier to keep clean.
Many other features. Write for bulletin.

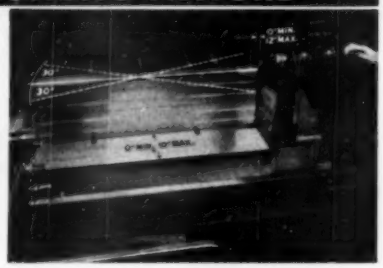
Operation Advantages

Dual clamping to Head and Column. Automatic clamping for Arm to Column.
Pushbutton operated Arm elevating control.
Automatic lubrication to column with column cleaned by wipers from top to bottom.
2 levers to control 36 spindle speeds from Head.
Direct reading and indicating speed and feed chart.
Electric light built in Head near spindle.
Adjustable counterbalancing spring operating with standard geared-to-spindle counterweight.
Positive feed clutch with serrated teeth.

THE CARLTON MACHINE TOOL CO.
CINCINNATI 25, OHIO, U. S. A.

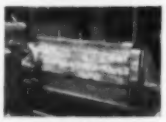
How To Save Time
IN YOUR MILLING DEPARTMENT WITH A SUNDSTRAND GENERAL PURPOSE MAGNETIC FIXTURE

Here's a new work-holding fixture for general purpose milling work. It saves on miscellaneous milling jobs by eliminating time losses for adjusting mechanical clamps and the cost of special jigs or fixtures. It is a complete unit with Sundstrand Magnetic Chucks mounted on an adjustable fixture. Chucks are quickly positioned as required by the size of work piece and easily adjusted for angular milling cuts. If you have miscellaneous milling jobs requiring frequent changeover from one part or cut to another, it will pay you to



Sundstrand Magnetic Fixture showing adjustments. Note clamping is performed by merely throwing switch.

investigate the savings possible with this new magnetic holding fixture. Sundstrand Magnetic Chucks are operated with an automatic demagnetizing control. There is no tube in rectifier to burn out. Generally, the input of the control unit is 110 volt A.C., which is rectified to 6 volt D.C., which in turn energizes the chuck. The low voltage eliminates possibility of shock to the operator, and no heat is produced to affect accuracy. Controls with inputs other than 110 volt A.C. can be furnished when required.



TYPICAL SET-UPS

These three set-ups illustrate only three of many different parts that are being run over one general purpose magnetic fixture in the manufacturer's plant.

Top — Milling steel tool blocks. Parts are run in lots of one to ten and are machined all over.

Center — Milling three steel cam bars simultaneously. Bars are 19⅝" long x 2¼" wide and 1¼" thick and are milled all over in six operations.

Bottom — Milling cast iron motor bracket slide. Part is held for eight different cuts with same fixture.

FREE
Additional Data

Complete information on Sundstrand Magnetic Chucks Will be sent on request. Ask for bulletin 1943M.

See this magnetic work-holding fixture demonstrated in booth No. 907 at the A.S.T.E. Show April 10 to 14 in Philadelphia.

SUNDSTRAND MAGNETIC POWER-GRIP CHUCKS

SUNDSTRAND MAGNETIC PRODUCTS CO.
Division of Sundstrand Machine Tool Co.
1306 18th AVENUE • ROCKFORD, ILLINOIS

Where to eat in Philadelphia — ask for *American Machinist*'s guide, at our booth, No. 416, at the A.S.T.E. Show.

turn pass without down feed allows the wheel to cut itself free and provides a fine finish. Depending on wheel size, from ½ to 1 hp is required to maintain cutting speeds of about 5000 sfm. A good flow of coolant is recommended to keep the wheel clean. Wheels are furnished with a sharp 90° corner on one side and 1/32-in. radius on the other. They are available in 3/32 and ⅛ in., and in 3-, 6-, and 8-in. dia.

The Wickman Manufacturing Co., 15533 Woodrow Wilson Ave., Detroit 3, Michigan. **Booth 109**

Lubricants Pump Designed for Automatic Mechanical Drive

Fully hydraulic and progressive action of the Model 3400 lubricant pump, according to the manufacturer, make it impossible to skip or under-lubricate a bearing. A single indicator provides positive proof that the system is operating properly. Microswitches are supplied as optional equipment to operate remote signal lights, bells, or horns to give warning when the pump reservoir is empty, or when excessive pressure is developed in the system. The pump is designed for use with small and medium-size machinery with bearings of average size. It is used primarily with Trabon systems.

Trabon Engineering Corp., 1814 East Fortieth St., Cleveland 3, O. **Booth 1116**

Vernier Height Gage Has Fine-Adjustment Screw

The slotted base of the Starrett No. 354 vernier height gage permits taking direct readings or scribing lines in any point from the base surface of the tool to the limit of its capacity. A fine adjustment permits measuring or marking off vertical distances ranging from 0 to 6 in. in thousands of an inch without calculations. The readily removable scriber has a mounting hole drilled in the opposite end so that it can be reversed and used for attaching an indicator. The tool is made of fine steel, ground to a fine finish on all surfaces. The bottom of the base and scriber are hardened and lapped.

The L. S. Starrett Company, Athol, Mass. **Booth 322**

Cyclone Dust Collector Adaptable For Outside Exhaust, Filter Bag

Cyclone Dust Collectors are said to provide up to 95% dust precipitation. Installed with screwdriver and wrench and occupying only 24-in.-dia floor space, the unit requires no

For uniform top performance

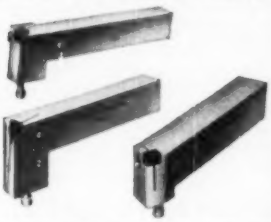
choose the carbides of uniform top quality

In the carbide field, in this carbide age, one name stands out above all others for quality, for performance, for dependability. That name is Carboloy.

Here are some of the standard tools and blanks that help make the consistent performance of *Carboloy* Cemented Carbide a standard throughout industry:

Carboloy Standard Tools—the least number of tools for the greatest number of jobs. Eleven low-cost styles adaptable for more than 80% of your general machining. Carboloy tools help increase production, give better finishes, reduce downtime . . . adding up to lower cost per piece.

Carboloy Standard Blanks—ideal for rush emergency jobs. Braze and grind them right in your own tool room. For general-purpose uses and for special applications. Save time on tool salvage programs, excellent for wear-resistant applications. Wide variety, immediate delivery.



Carboloy Standard "Insert" Tools—single point tools with multiple cutting edges. For economy in chamfering, turning and facing operations. Six sizes, 34 styles. Reduce maintenance time, simplify grinding, increase number of pieces per grind. Or order Standard Carboloy "Insert" Blanks; use them in your own tool holders—economical, efficient, speedy.

COORDINATED CARBIDE CONTROL

THE CARBOLOY "TRIPLE C" PLAN

FOR EVEN GREATER SAVINGS WITH CARBIDES

These Carboloy standards all add up to amazing savings especially when used as part of a Coordinated Carbide Control program in your plant. The Carboloy "Triple C" Plan is specifically devised to provide you with the information to set such a plan in operation. It can help you lower your important break-even point by reducing costs, increasing production and eliminating waste. Check this plan now; write for further information and Triple C Plan Book. Carboloy Company, Inc., 11149 E. 8 Mile Street, Detroit 32, Mich.

Visit Carboloy Booth No. 736 at the A.S.T.E. Show

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VICKERS CONTOUR PROJECTOR

PRICE $1375

Takes work up to 4" diameter . . . controls manipulated with image under observation.

This Projector consists of the base instrument including two coordinate measuring stages with graduated tilting movement and two alternative condenser systems. It is specially designed to measure magnified silhouettes of templates and similar objects as well as screw threads. It provides the means of comparison with master standard screw thread templates under magnification. Illumination sufficient to permit use in well-lighted room.

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THE R. Y. FERNER CO., INC.

100 Pleasant St., Boston 48 (Malden Sta.), Mass.

Also: Cooke Works Measuring Microscope • Cooke Optical Dividing Head

SACKMAN ADJUSTABLE SWING TOOL HOLDER

(Trade Mark)

HOLDS RIGID! NO CHATTER!

Advantages of the new, adjustable tool holder for lathes designed by W. H. Sackman Co., Inc., offer you a whole range of savings because of these revolutionary features:

- Solves difficult problems by holding wide form tools or carbide tools rigid with complete absence of chatter.
- Adjustable posts allow variety of tool sizes.
- Two tools held at one time in this unique swing tool holder.
- Provides high speed production.

Sizes for 9" to 16" lathes . . . larger sizes on special order.

While in Philadelphia Phone Us for Demonstration.

WRITE US TODAY.

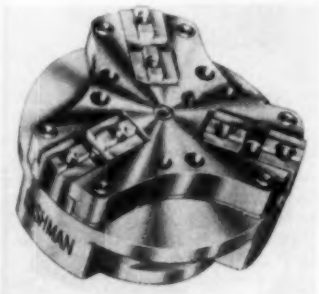
W. H. SACKMAN CO., INC.

44 N 4th STREET PHILADELPHIA 6, PA.

operator attention and can be emptied by the janitor. It can be adapted for either outside exhausts or equipped with a filter bag. The recirculating bag unit collects fine dust and recirculates the clean air, saving heat loss. The units are available with 250-, 500-, and 725-cfm capacities, requiring ½-, 1-, and 1½-hp motors respectively.

The company is also introducing a solid carbide insert grinding fixture described as a fast production tool to expedite accurate grinding of solid carbide inserts.

Hammond Machinery Builders, 1600 Douglas Avenue, Kalamazoo, Michigan. **Booth 725**



Aluminum-Body Chuck Cuts Down High-Speed Inertia

The jaws of this chuck are aligned on hardened-steel bearing surfaces for application to machines operating at high speeds. It is said to eliminate much of the difficulty experienced with clutches and breaks for quick starting and stopping of spindles.

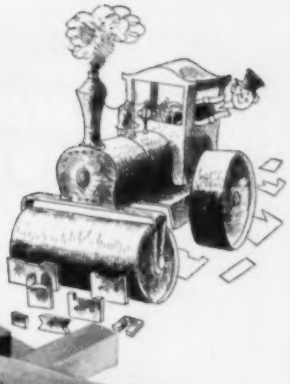
The Cushman Chuck Co., Hartford, Conn. **Booth 886**

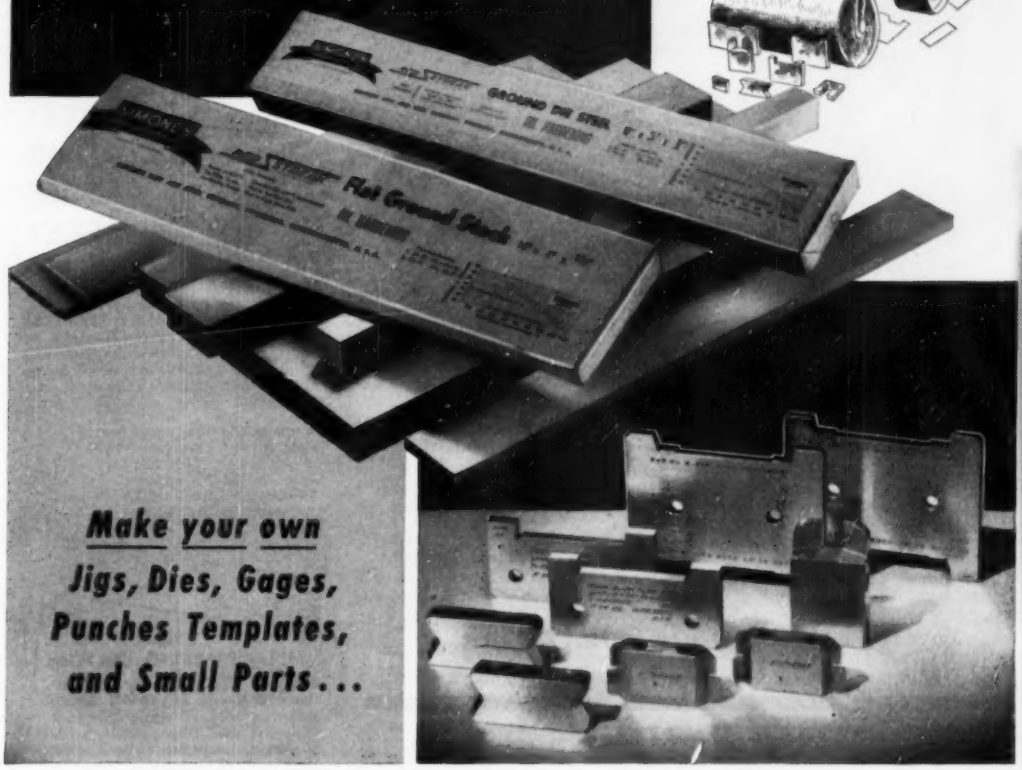
Pneumatic Relay Designed for Accurate, High-Speed Operation

The cutoff point on this pneumatic relay for air-electric switches and other equipment requiring accurate, high-speed operation, can be set for any pressure between 0 and 35 psi. Overloading with input pressures up to 70 psi will not damage the instrument and supply pressures as high as 50 psi may be used. The design provides a high amplifying ratio so that small change in input pressure results in full change in output. When used with high-magnification pneumatic comparator gage (0.0004 in. full scale) and a commercial pressure switch, the relay will operate a signal light on a dimension change as small as 0.000002 in.

Moore Products Co., Philadelphia 24, Pa. **Booth 301**

Flatten Your Tool Costs!





Make your own Jigs, Dies, Gages, Punches Templates, and Small Parts...

...use SIMONDS Flat Ground Stock & Ground Die Steel

100% QUALITY-CONTROLLED in Simonds own steel mill is this *oil-hardening* tool steel . . . uniformly annealed for easy cutting, machining and punching. Doesn't have to be ground to size . . . dimensions are uniformly accurate, edges finished, ends milled, surfaces micro-finished. No deformation in heat-treating . . . so you don't lose the hours and material put into punches and dies before hardening.

156 sizes are regularly carried in stock, each individually packaged, fully protected from rusting and scratching, with dimensions and heat-treating instructions clearly given. Order from your Industrial Supply Distributor.

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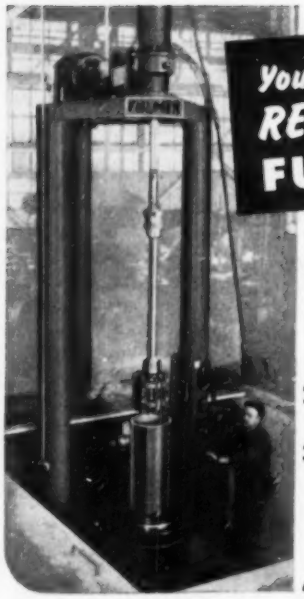

Fulmer Model 20-72 honing large Diesel liner.

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1 **NITRIDED STEEL AUTOMOTIVE CYLINDER LINER**
3.06″ bore x 6.43″ length x .040″ thick. .005″ of stock is removed to ±.00025″ tol. in less than 1½ minutes per piece.

2 **GAS ENGINE CYLINDERS**
11″ bore x 30″ length. .008″-.012″ of stock is removed in 4 to 5 minutes.

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Two 4.250″ bores, in line, each 6″ in length. .005″ of stock is removed with surface finish of 10-12 micro-inches in 1 minute. Saved 90% on production time, improved finish 1000%, over previous reaming operation.

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12¾″ bore x 30¾″ length. .006″-.008″ of stock is removed in 5 minutes. Previous *honing* time was *2 hours!*

Any internal cylindrical surface, ½″ to 30″ diam., can be finished faster, more accurately, at *less cost* by FULMER HONING. These machines offer the greatest value in the honing field. Investigate their advantages for your production. Write now for details and your copy of new 12-page honing bulletin.

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Get your free copy of STAR'S "Metal Cutting" Booklet and the STAR Wall Chart for your shop! Both are packed full of useful information and will help you get maximum results from hand, band and power hack saw blades.

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Manufacturers of Hand and Power Hack Saw Blades and Frames, Metal Cutting Band Saw Blades and Clemson Lawn Machines.

...SAVE TIME...SAVE MONEY

SIDNEY LATHES are designed and built to provide accurate, economical and rapid production. Every effort has been made to facilitate the operation of the various units and increase productivity.

32 SPEED LATHES are equipped with an all-herringbone geared headstock which provides 32 pre-selective spindle speed changes. Dial controlled gear box is totally enclosed with all moving parts running in oil. Built-in 14", 16", 18" and 20" sizes in both tool room and engine lathe models.

12-SPEED LATHES feature sliding spur tooth geared headstock and are manufactured in engine lathe and gap lathe models. Gap lathes are provided with removable gap block and are available in 14", 16", 18" and 20" sizes. Engine Lathes range in size from 14" to 32".

16-SPEED LATHES incorporate an all-herringbone geared headstock, dirt and chip proof gear box, and like all Sidney Lathes the rugged four wall bed construction with double cross girts. Built in both engine and tool room models in 14", 16", 18" and 20" sizes.

25" 16-SPEED ENGINE LATHE with herringbone geared headstock. Gear box provides 48 changes of threads and feeds. Anti-friction bearings throughout the headstock, end gear train and apron.

32" 16-SPEED ENGINE LATHE is husky and powerful, built to take heavy cuts, yet extremely sensitive for thread chasing and finish turning. Herringbone gears are used throughout the headstock thus eliminating end thrust and producing finished work free from gear tooth and tool marks.

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Builders of Precision Machinery Since 1904

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- 100% Bearing Surface for long life, low maintenance
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- Accuracy for sealing pump and valve pistons, maintaining pressures, preventing leakage

And They Save Time, Cut Production Costs because SUNNEN HONING:

Eliminates chucking, fixtures, set-up time • Maintains accurate alignment • Eliminates selective fitting • Speeds assembly • Reduces rejects • Salvages valuable parts • Hones all metals, ceramics and glass • Is accurate to within .0001".

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Henry Lackman, *Foreman*
Wagner Electric Corp.

Hydraulic brake wheel cylinder
Material = Cast iron
Hole Diameter = 1.125"
Length = 3.250"
Tolerance = .001"
Finish = 20 micro-inches
Stock Removal = .001"
Production = 1 per minute

Assures Longer Service Life

John Menefee, *Plant Superintendent*
Lincoln Engineering Company

Grease pump barrel
Material = Steel tubing
Hole Diameter = 1.623"
Length = 5" • Tolerance = .001"
Finish = 8 micro-inches •
Stock removal = up to .010"
Production = 10 per hour

Removes Distortion After Hardening

A. J. Stamm, *Plant Superintendent*
Measuregraph Corporation

Pump engine tappet with tandem holes
Material = 1020 carburized steel
Hardness = Rockwell 60-63 "C"
Hole Diameter = .625"
Length = 1 5/16" (each hole)
Tolerance = .00025"
Finish = 10 micro-inches
Stock removal = .0005" to .001"
Production = 1 per minute

Produces Accurate Parts—Economically

Wm. Barry, *Foreman*
Lewis Invisible Stitch Company

Sewing machine "looper carrier"
Material = Drop forging
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Hole Diameter = .250"
Length = 1"
Tolerance = .0001"
Finish = 15 micro-inches
Stock removal = .0005" to .0007"
Production = 40 per hour

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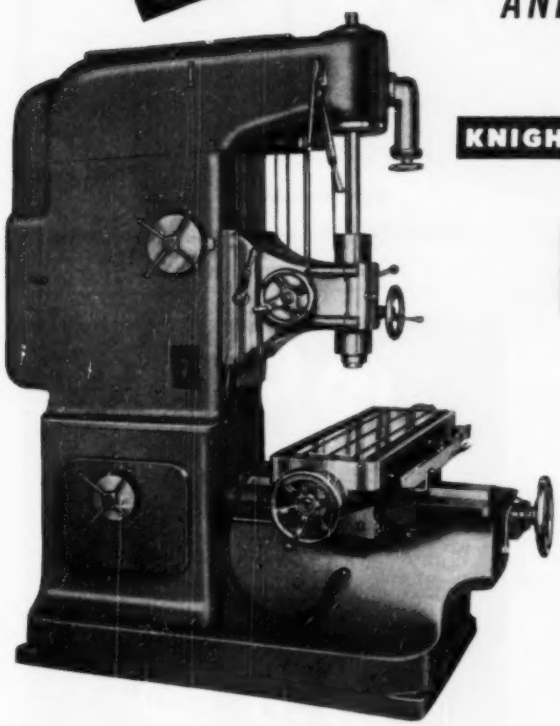
THE ANSWER!

FOR *BOTH* PRECISION BORING *AND* VERTICAL MILLING



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—A SINGLE Machine That Does The Work Of 2 Or More Single-Purpose Machines!

Eliminates Work Transfers
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- **Handles an extreme range of difficult precision work**
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- **Rugged bed-type construction assures positive accuracy — 7½ H.P. all-gear drive provides ample power for the big, tough jobs**
- **Convenient, quick-action controls — full vision work areas — easy setup — all reduce job time, increase output**

Sixteen Spindle speeds, 40 to 2000 r.p.m.—9 Spindle feeds, .005" to .010"—100" table traverse per minute in both directions—16 Table feeds, 5/16" to 20" per minute

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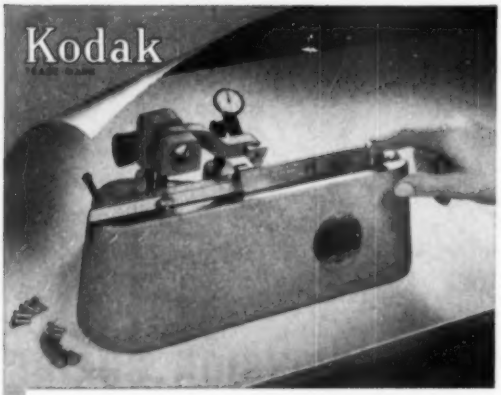

Kodak Conju-Gage, Model 1S, for testing gears up to 1¼-inch pitch diameter.

Test gears in *action*

Test your production gears while revolving . . . test them against the Kodak Conju-Gage Worm Section. For the composite check of gears, it's more accurate, less expensive, and more versatile than a circular master gear for the same test. It's much easier and far faster than older methods using measuring wires.

With a Kodak Conju-Gage and a single Worm Section for a given normal pitch and pressure angle, you can check "green" gears or shaved gears . . . with any desired amount of backlash . . . and any helix angle . . . of either hand. The composite test checks the runout, base pitch error, tooth thickness variation, profile error, lateral runout, and lead error in a helical gear—all in one operation.

Costing no more than conventional types of variable center distance fixtures, the Kodak Conju-Gage cuts costs by PASSING EVERY RIGHT GEAR . . . REJECTING EVERY WRONG GEAR.

See this Kodak Conju-Gage (and other models handling gears up to 8¼-inch pitch diameter) demonstrated at the Tool Engineers Industrial Exposition . . . in the Kodak Exhibit, Space 816.

EASTMAN KODAK COMPANY
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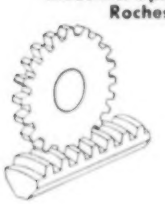

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Only ERRINGTON *Adjustable* TAPPING HEAD
Offers So Many Advantages

Sizes: #0 - #10 Tap to 5/16"
#1 - 5/16" Tap to 1 2"

No. Spindles: 2 to 6

Here's a versatile tool which permits you to take advantage of a wide range of adjustment — without overhang. Supplied with 3 spindles for equal adjustment in line and 3, 4, 5 or 6 spindles for equal adjustment on bolt circles.

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- **Non-slip positive clamping on all adjusting members**

See our Exhibit A.S.T.E. April 10-14 Booth 554

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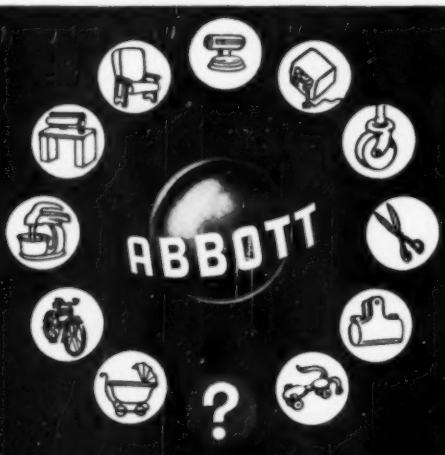

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DON'T FORGET—THE LIFE YOU SAVE MAY BE YOUR OWN

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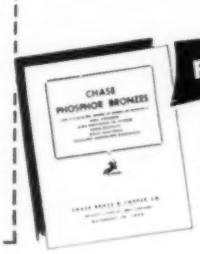

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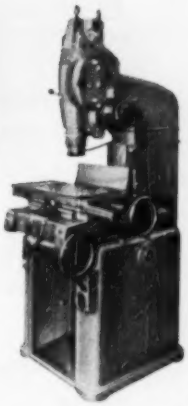

See these high precision... high production... machine tools in action at the A. S. T. E. Show. Learn why American Industry uses so many

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241 — Pivot Polishing Machine
2BA — Jig Boring Machine
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SCHAUBLIN

SV102 — Tool Makers Lathe
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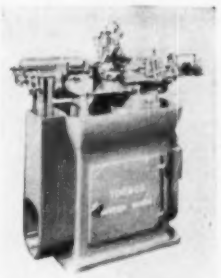
SV12 — Milling Machine
SV28 — Machine for sharpening Gun Boring Drills



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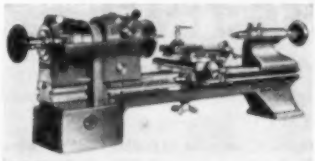

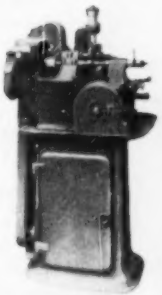

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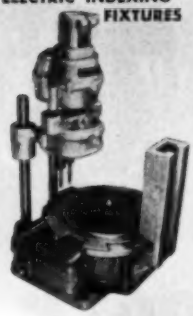

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BOOTH No. 732

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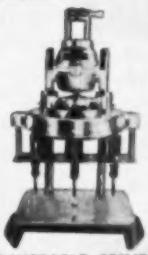

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DRILL & TAP CHUCKS

Jig in a Jiffy

"YANKEE"

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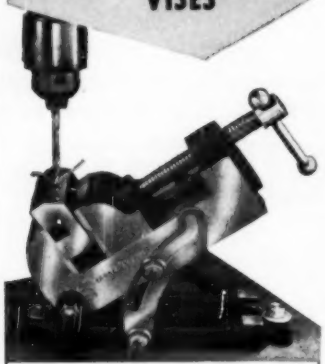
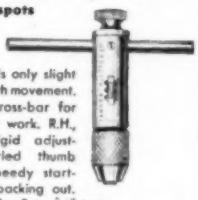


Easily converted to fast-acting, economical jig. Shortcuts costs on small jobs. Lock the work in the "Yankee" Angle Vise. Tilt for the angle and lock. You're set up for every operation . . . hand or machine. Also available with quick-release swivel base. Two jaw widths . . . 2" and $2\frac{3}{4}$". Each vise supplied with grooved "V" Block for holding rounds.

"Yankee" Ratchet Tap Wrenches for tight spots



Ratchet needs only slight back and forth movement. Adjustable cross-bar for close-quarter work. R.H., L.H. and rigid adjustments. Knurled thumb piece for speedy starting in and backing out. Two lengths for 0 to $\frac{5}{8}$" taps, one for 0 to $\frac{3}{8}$" taps.

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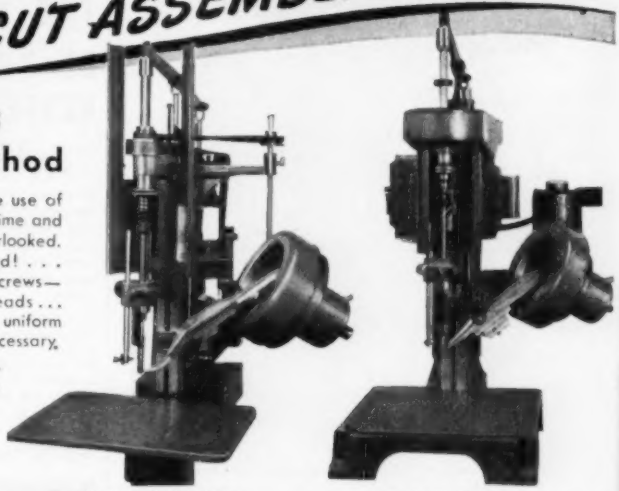

Model B—Pedestal Type

Model A—Bench Type

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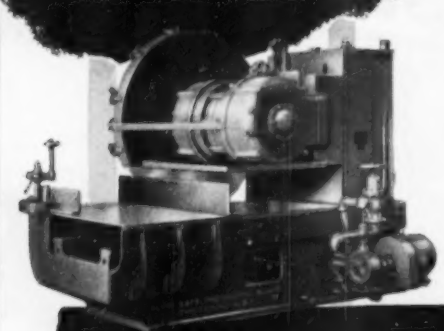

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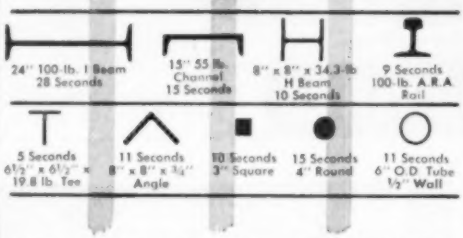

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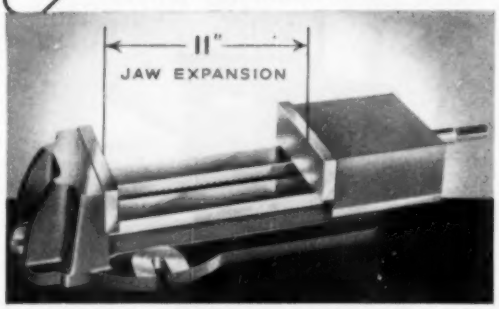

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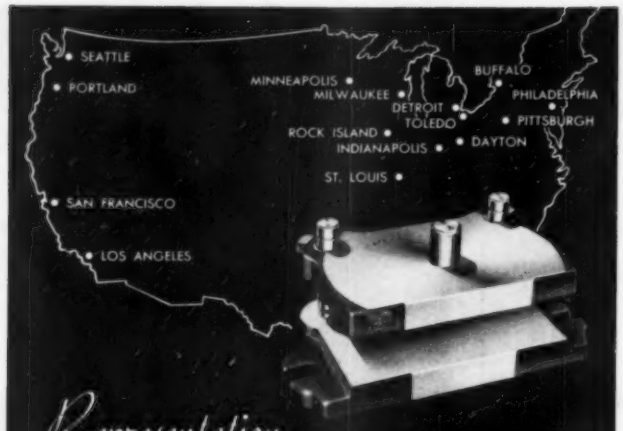

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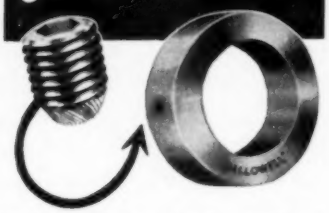

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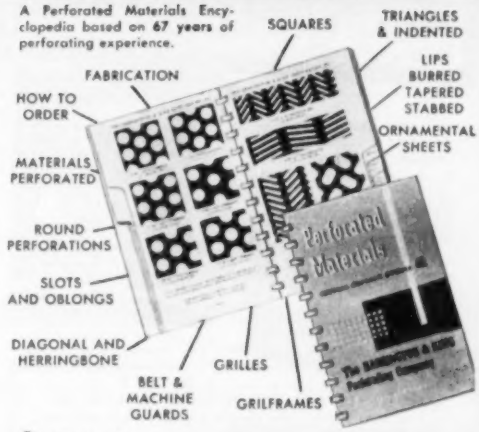

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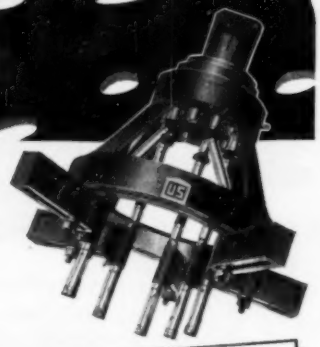

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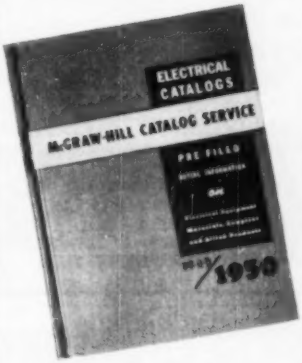

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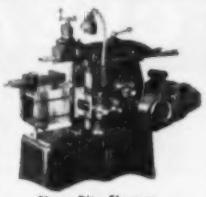
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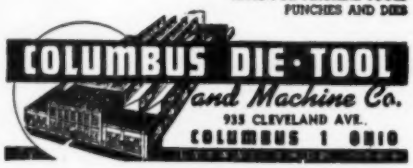

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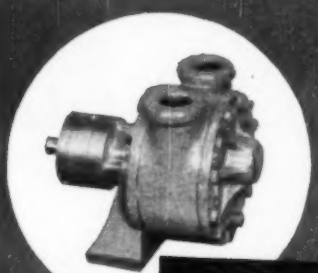

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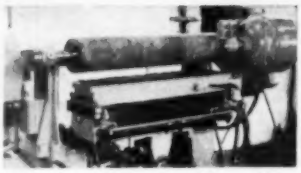

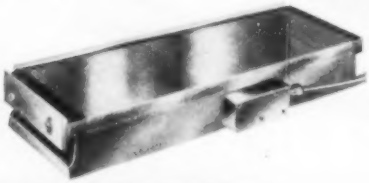

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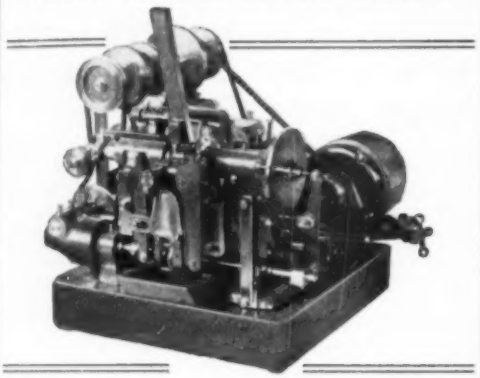

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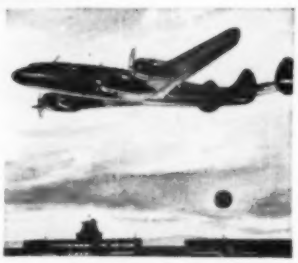

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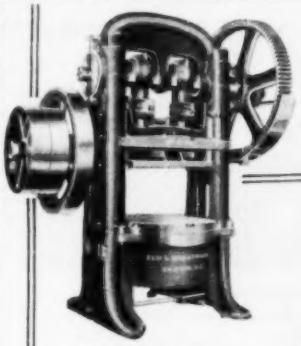

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Built in three styles: Pillar or Solid Frame construction . . . 4-25 tons; Gap or Overhanging Frame . . . 25 and 36 tons; Built-Up Construction . . . 50-150 tons.

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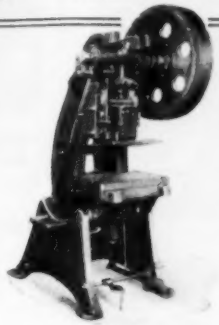

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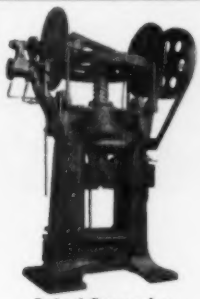

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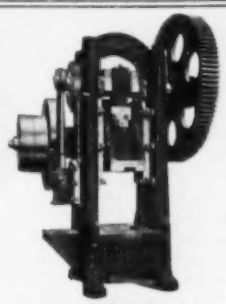

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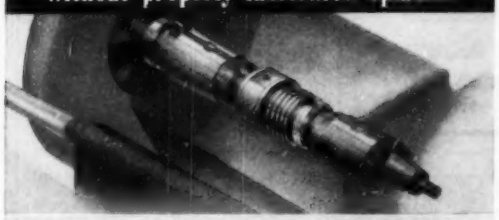

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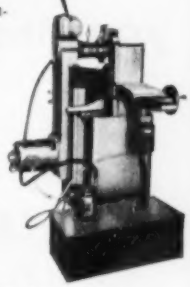
Split-second COOLANT FLOW WITH RUTHMAN GUSHER MACHINE TOOL COOLANT PUMPS

Illustrated is a Crystal Lake Custom Built Surface Grinder equipped with Ruthman Gusher Coolant Pump. Photo courtesy of Crystal Lake Grinders.



Split-second coolant flow from a trickle to full volume is one of the outstanding characteristics built into every Gusher Coolant Pump. Heavy duty pre-lubricated ball bearings, totally enclosed drip-proof motor, dynamically balanced rotating parts, lower power consumption when throttled are original design features that make Gusher Coolant Pumps efficient, economical and trouble-free in operation. You want the best—specify Gusher Coolant Pumps on your machines.

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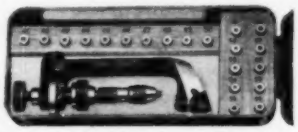

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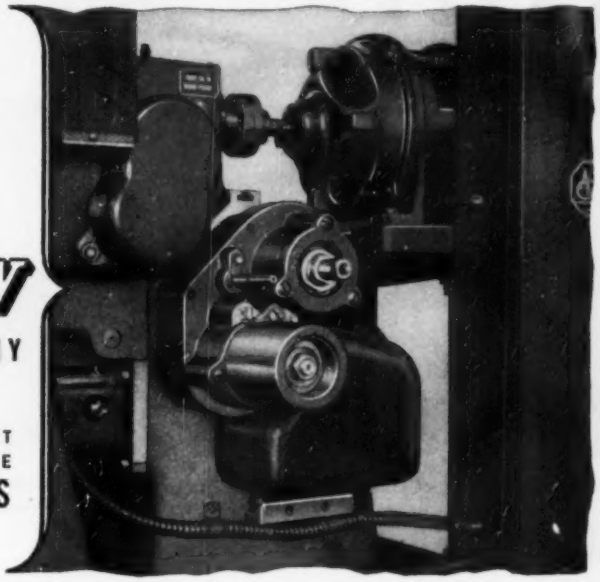

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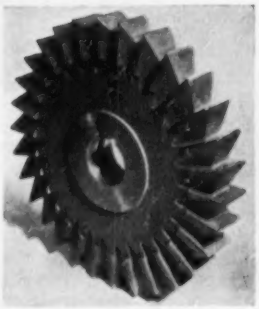

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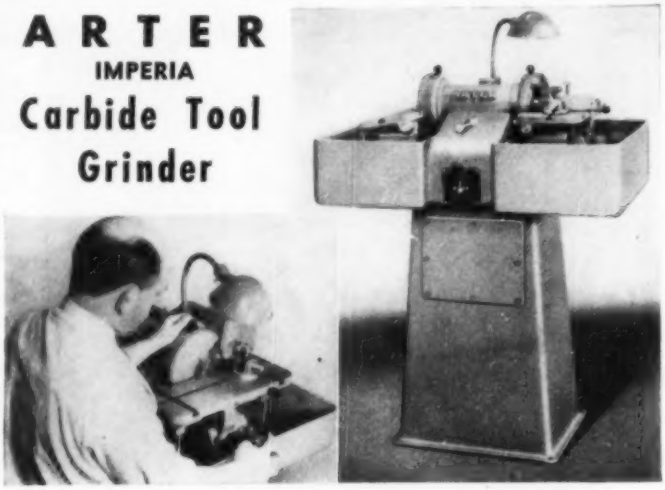

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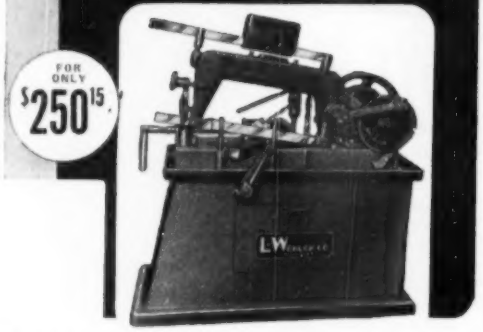

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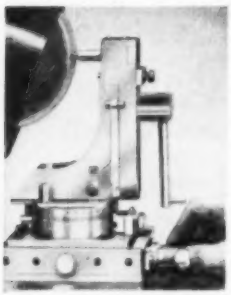

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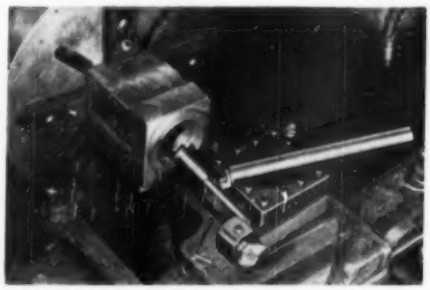

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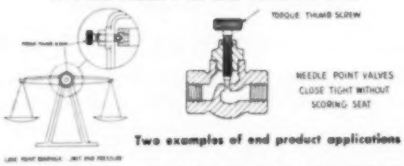

Two examples of end product applications

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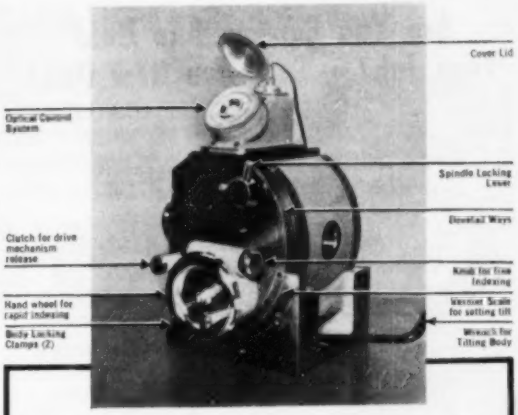

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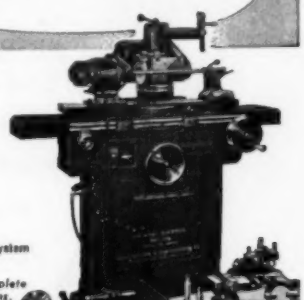

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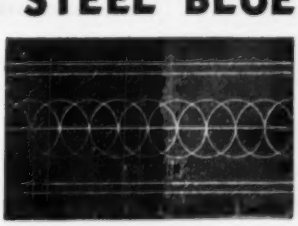

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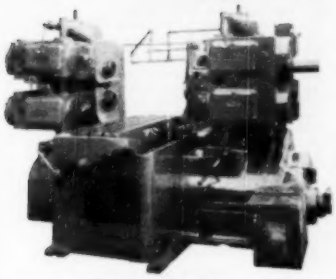

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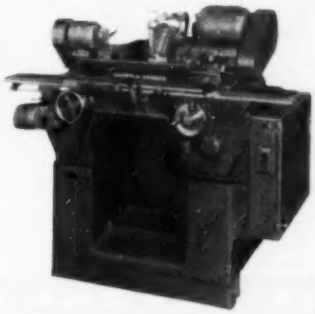

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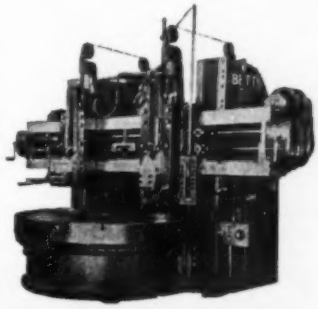

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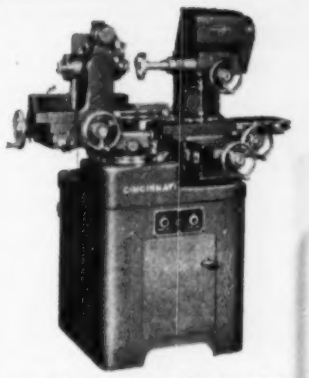

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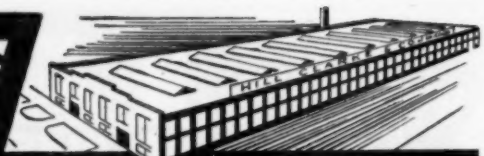

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No. 45-48 Cin. Hyd. Tracer (1941)
No. 56-72 Cincinnati Hydromatic
No. 56-90 Cincinnati Hydromatic
4½"x12" Pratt & Whit., Model C Thread Mill
6"x36" Lees-Bradner—Model HT (1943)
10"x48" Hanson-Whitney Thread (1942)
12"x24" H.T. Lees-Bradner (1942)
24"x24"x12' Ingersoll Adj. Rail Slab Miller
36"x24"x12' Ingersoll Duplex Miller (1946)
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)
No. 28-80 Cincinnati Hydrotel

MISCELLANEOUS
18" Dill Slotter
Micromatic Vertical & Horizontal Hydrohoners

PLANERS
36"x36"x12' Cincinati
36"x36"x18' Gray Maxi Service, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

Ask for our COMPLETE LIST

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
[illegible]INGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500

W16 FEATURES
AUTOMATICS
1" #60 New Britain Gridley
1¼" Nat. Acme R-6
8¾" 5 spdle. Cone
1½" Billings & Spencer "di-matic" cut-off

DRILLS
3' 11" American triple purpose radial
#14 Natco mult. spdle. #3 MT
3 spdle. Edlund #3 MT, center spdle. has tapping
30 HD Baker inverted HD

GRINDERS
6x18" Norton plain cyl.
10x18" Cinc. cyl. "EA"
10x36" Cinc. cyl. "EA"
#16 Blanchard, 30" mag. chuck
#2 Norton T & C
16, 36 Bryant Internal

GEAR
#17 Gleason Hypoid grinder
15" Gleason lappers
#72 Fellows shaper
2C Sykes Generator

LATHES—TURRET
8x108" Lo swing
12½x48" centers Sheldon
16"x6' Southbend
27"x10' centers B & E
8x15' Sundstrand Stub

OUR GUARANTEE
If any machine guaranteed by us does not prove satisfactory mechanically, the purchaser may return it freight prepaid within 30 days and we will refund the purchase price in full.

W16 FEATURES
14"x36" L & S duplicating
20"x56" centers L & S
#4 W & S. bar
2L Gisholt 16"
#2 Simmons, 1¼" cap.

MILLERS
08 Cinc. horiz. & vert.
#12 B & S production
#104 K & T bed type prod.
2H K & T plain
#4 Cinc. plain dial type
5H K & T vertical

45-48 Cinc. hydromatic
34/35 Cinc. hydromatic
#2 Kempsmith plain
#3 Kempsmith univ.
#2g Kempsmith univ.

PRESSES—PLANERS
150 ton H & W dieing machine
75 T. Farquar Hyd. Forming, 48" str.
125 T. Cleve. 26x26", 7" st.
150 T. 306½ Bliss S. & 5" st.
200 T. Clearing SA ECC, 26" st., 36"x42"
400 T. Bliss Hydro-dynamic 37x40", 36" str.
1500 T. Hyd. HPM, 48x48", 12" str.
1000 T. Bliss Knuckle joint embossing
12½x14'3"x36' Mesta Planer
10B42 Verson, 500 ton

MISCELLANEOUS
96" Ohio rotary table
#50 Excello thread grinders
#31, 31L & 35L thread grinders
613 J & L thread grinders

T. R. WIGGLESWORTH MACHINERY COMPANY
1721 SUPERIOR CLEVELAND 14, OHIO SUPERIOR 18727

UNUSUAL VALUES

Milling Machines—No. 1 Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36" Surface 13"x32", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—10"x6', 3', 10'—18"x8', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
Large stock 19" and 16" bench and floor type.

Planers—Single head 24"x6', 24"x8', 28"x8'.

Shapers—16", 20", 24" B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 20", 40".

SPECIAL—New totally enclosed dust proof, fan cooled ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" Hi Duty 3" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x18' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88 Columbus 16, Ohio

AUTOMATIC SCREW MACHINE
4⅛" CONE FOUR SPINDLE. New 1941. AC motor driven. With large quantity of equipment.

J. L. LUCAS & SON, INC.
P. O. Box 3006A Bridgeport 5, Conn.

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BLISS, TOLEDO, V & O, ETC
REBUILT GUARANTEED
MBMA
JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa

LATEST TYPE *Nearly New* MACHINES

BORING MILLS—Horizontal
CINCINNATI GILBERT 3½" bar, floor type, latest
DETRICK & HARVEY 4" bar, Floor Type, M.D.
GIDDINGS & LEWIS #25T, 2½" bar, Latest Type
GIDDINGS & LEWIS #45, 4½" bar, Motor Drive
GIDDINGS & LEWIS #45, 4½" bar, Motor Drive
HEALD 48A, 49 single end, Horizontals, Latest
LANDIS—3½—3½" bar, floor type, M.D.
LUCAS #41, 3" bar, Table Type, Latest Type
LUCAS #43, 3" bar, Table Type, Late Type
NILES-BEMENT-POND 3", 3" bar, Floor Type, M.D.
UNIVERSAL 2" bar, high speed, latest type

BORING MILLS—Vertical
BULLARD 4" 8 spdle, Mult-Au-Matic, Type J, Latest
BULLARD 6" 6-spdle Mult-Au-Matic Type D, Latest
BULLARD 12" 6-spindle Mult-Au-Matic Type D, Latest
BULLARD 12" 6-spindle Mult-Au-Matic Type D, Latest
BULLARD 24" 36" Turret—"New Era" Side Head, M.D.
BULLARD 24" 36", 42" Vert. Turret "Spiral Drive", High Speed, Latest Type
BULLARD 64" "Cutmaster", Latest Type
COLBURN 72", 2 swivel heads, PRT, M.D.
KING 62" 2 swivel heads, PRT, M.D.
NILES 100", 2 swivel heads, Rapid Traverse, AC M.D.

BROACHES
CINCINNATI 1-36, 3-36, Duplex Vertical Surface, Hyd., Double Ram, Model EB, Latest Type
LaPOINTE 5-36 Vertical, Hyd., Latest Type

DRILLS—Miscellaneous
BARNES R-3 "Hydram," Hydraulic, 3" capacity—for Inverted drilling, Latest Type
LELAND & GIFFORD #1LMS, 4 Spindle, Latest Type
LELAND & GIFFORD #2SMS Single Spdle.
LELAND & GIFFORD #2LMS 6 spindle, Latest
LELAND & GIFFORD #2LMS 6 spindle, Latest Type
NATCO #1AL Multiple, 30 spindles, Hyd., Latest Type

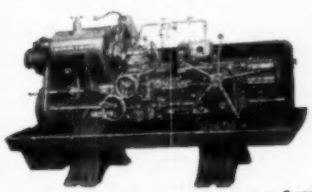
DRILLS—Deep Hole
BARNES 420/2 Spindle Hydraulic, Latest Type
LeBLOND #2 Single Spindle, Hydraulic, Latest Type

DRILLS—Radial
AMERICAN 4' arm 11" column, "Hole Wizard", 3-way base, Latest Type
AMERICAN 4' plain Triple Purpose, Motor Drive
AMERICAN 5' arm 15" column Plain, M.D.
AMERICAN 5' arm 15" Column, Plain, M.D.
CINCINNATI BICKFORD 5' 5'12" Column, Plain, M.D.
CIN. BICKFORD 6' arm 15 col. Plain or Univ., M.D.
DREIS&KRF 5' arm 15" column Univ., M.D.
WESTERN 6' arm 20" column Plain, Latest Type

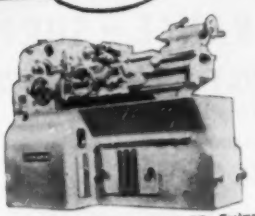
GEAR CUTTING EQUIPMENT
BARBER COLMAN Type A Hobber, Long Base, for Splines, Latest
BARBER COLMAN #12 Hobber, Single and Double Gearing, Motor Drive
BILGRAM 6" and 16" cap., Bevel Gear Gen., M.D.
BROWN & SHARPE 6-60 Gear Cutter, Motor Drive
BROWN & SHARPE #13 Spur and Bevel Cutter, M.D.
CROSS #1 Tooth Rounding Machine, Motor Drive
CROSS #50 Universal Gear Chamfering, Latest Type
FELLOWS Model 6L, 6LA, GZ3, Z, 7A, 7, 72, 725, 77
High Speed Gear Shaper, Latest Type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #13LS Lapper, Latest Type
FELLOWS 8M Red Liner, Latest Type
GLEASON #14 Hypoid Spiral Grinder, Latest Type
GLEASON 5", 12" straight bevel generator, latest type
GLEASON #4, #6, #18 Bevel and Hypoid Tester
GLEASON #14 Hypoid Generator, Latest Type
GLEASON 24", 120" 90° Straight and Bevel Gear Planer, Motor drive
GOULD & EBERHARDT 12H Hobber, DIFF., Latest
GOULD & EBERHARDT 96H Hobber, with diff. M.D.
GOULD & EBERHARDT 96H Hobber, with diff. M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest
SCHUCHARDT & SCHUTTE #1 Hobber, Motor Drive

GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #2 Plain, 5 x 12, Latest Type
LANDIS 6x18 Type H Plain Hyd., Latest Type
LANDIS 8"x18" Type C Plain, Hyd., Latest Type
LANDIS 8"x18" Type C Plain, Hyd., Latest Type
LANDIS 20"x120" Plain Roll, Motor Drive
NORTON 6"x18", 6"x30", 14"x36", 10"x72" Type C. Plain, Latest Type

GRINDERS—Miscellaneous
BARBER COLMAN #3, #4 Hob Sharpener, Latest
BROWN & SHARPE No. 13 Univ. Cutter & Tool, Lat.
BRYANT #3, #6, #7 C-16, 16" CP-16, 24-36" Internal, Hydraulic, Latest Type
CINCINNATI #2 Centerless "Filmatic", Latest
CINCINNATI "Monoset" Tool & Cutter, Latest
CINCINNATI "Monoset" Tool & Cutter, Latest
FITCHBURG 14"x20" Spline hydraulic, latest
GARDNER 12" Disc Grinder, Latest
GLEASON #12 tool sharpener, Latest Type
HEALD 72A3, 72A5 "Gagmatic" Internal, Latest
HEALD 72A3, 72A5, 74 Internal, latest



BARDONS & OLIVER #5 Univ. Ram Type Turret Lathe, Swing—18"; Hole through spindle—2⅝". Latest Type



MONARCH 10"x20" Centers, Model EE, Toolmaker's Lathe—With taper attachment, Latest Type

HEALD #81 Internal, Centerless, Sizematic and Gagmatic, Latest Type
KEARNEY & TRECKER Face Mill Grinder, Latest
KEARNEY & TRECKER 6x15, 8x18 Auto Thread, latest
JONES & LAMSON 6x15, 8x18 Auto Thread, latest type
LANDIS #6, 6x24 Thread, latest type
LANDIS #12 Centerless, Hydraulic, Latest Type
LANDIS #12 Centerless, Brouch Sharpener, Latest
La POINTE 6" Universal Brouch M.D.
THOMPSON 6"x18" Auto. round brouch M.D.
VAN NORMAN #620, #630, #73 Oscillating Radius Grinder, Latest Type
VAN NORMAN #666 Crankshaft ReGrinder, Latest

GRINDERS—Surface
BLANCHARD #11, 10" dia. mag. chuck, Latest
BLANCHARD #16, 24" dia. mag. chuck, Motor Drive
BLANCHARD 16A Vertical, Dial Feed, Motor Drive
BLANCHARD 16A Vertical, Hyd., Latest
HANCHETT Series 300 12"x18" Vert. Hyd., Latest
HANCHETT #36 Vert. 36" dia. mag. chuck, Latest
HANCHETT #120 30x120" Plano, Hyd., Horiz. Latest
HANCHETT #120 30x120" Plano, Hyd., Horiz. Latest
HEALD #22 Rotary, 12" chuck, latest type
HEALD 25A—rotary—16" and 20" chuck, Hyd., Latest
NORTON 6x18 Hydraulic, latest type
THOMPSON 12x12x24 Type D Hyd., Latest Type

JIG BORERS
KEARNEY & TRECKER Model B Autometric, Latest
PRATT & WHITNEY 1A, Motor Drive
SOCIETE GENEVOISE (SIPF) #4 Precision, Table 19"x27", Motor Drive

LATHES—Engine and Mfg.
AMERICAN 16"x54", Centers, Geared, Motor Drive
AMERICAN 42"x300" Centers, 1 carriage, Motor Drive
AMERICAN 42"x300" centers, 2 carriages, motor drive
AMERICAN 26"x300" centers, Hydraulic, Latest Type
HENDEY 12x30", 14x30", Timken, Latest Type
JONES & LAMSON "Fay" 20x25", 24x24 autom., latest
LeBLOND 21"x96" Centers, Geared, Motor Drive
LeBLOND 21"x96" centers, TIMKEN, latest type
LEHMANN 16x30" centers, TIMKEN, Latest
LODGE & SHIPLEY 16"x30", 14"x30" Timken, Latest
LODGE & SHIPLEY 16"x30", 14"x30" Timken, Latest
LODGE & SHIPLEY 18x72 centers, M.D.
LOWING 4x60, 4x84, 8x60, 8x108, 5x54, Latest
LOWING 4x60, 4x84, 8x60, 8x108, 5x54, Latest
MONARCH 10"x20" Centers, Model EE, Timken, late
MONARCH 10"x20" Centers, Model CKK, Timken, late
MONARCH 12"x30" Centers, Model CK, Timken, latest
MONARCH 12"x54" Centers, Model CW, Latest
MONARCH 16"x78" Centers, Model CW, Latest
MONARCH 16"x78" Centers, Geared Head, M.D.
MONARCH 24"x84" Ball Bearing, Geared Head, M.D.
MONARCH 27"x192" Centers, Model CM, Timken
MONARCH 27"x192" Centers, 3 Carriages, Timken Bearing, Model CM, Motor Drive
MONARCH 22"x84" Centers, 3 Carriages, Timken
NILES 30"x96" Boring "Time Saver" Timken, Latest
NILES 30"x96" Boring "Time Saver" Timken, Latest
PRATT & WHITNEY 16"x30" centers, Timken, latest
PRATT & WHITNEY 10"x20" centers, Bench, latest
PRATT & WHITNEY 10"x20" centers, Bench, latest
PUTNAM 42"x25" Centers, Motor Drive
REED PRENTICE 20"x84" Centers, Model A, Latest
REED PRENTICE 20"x84" Centers, Toolroom, Latest
SOUTH BEND 14½"x60" Centers, Timken, latest type
SPRINGFIELD 16"x30" centers, Timken, latest type
WARD, HAGGAS & SMITH—18/30x60" centers gap. motor drive, Latest Type

LATHES—Hob and Cutter Relieving
CLEVELAND 12"x16" Centers, Cutter, Motor Drive
CLEVELAND Universal, Latest Type
MICHIGAN 1712 Universal, Latest Type
U.S. Tool #810B, 8"x15" Centers, Cutter, Latest

LATHES—Turret
BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
FOSTER #4FU "Fastermatic," Timken, Latest
GISHOLT #1L, #2L, #3L Universal, Latest Type
GISHOLT #2, #4 Univ., #5 Univ., Timken, Latest
JONES & LAMSON #2, #3 Univ., Timken, Latest
LIBBY "International" 1H5 Univ., Timken, Latest
MOREY No. 2G No. 3, No. 4 Timken Bearing, latest
MOREY No. 2G No. 3, No. 4 Timken Bearing, latest
POTTER & JOHNSTON #3DE, Timken, Latest
WARNER & SWASEY 5, Universal, Timken Bearing
WARNER & SWASEY #2, #3, Timken, Latest type
WARNER & SWASEY 2A Universal, Timken Bear.
WARNER & SWASEY 2A Universal, Timken Bearing, "Pre-selector" Bar and Chucking, Latest Type
WARNER & SWASEY 3A Universal, Timken Bearing Bar and Chucking, Latest Type

MILLING MACHINES—Mfg.
GRAY 84"x32"x16' Planer Miller, 2 heads, Latest Type
HALL Style L, Planetary, latest type
INGERSOLL 42"x96"x12" adj. rail, 4 heads, AC, M.D.
INGERSOLL 42"x96"x12" adj. rail, 4 heads, AC, M.D.
INGERSOLL 32x24x10' Planer Type, 2 heads, AC, M.D.
INGERSOLL 30x24x12' adj. rail slab, M.D.
INGERSOLL 30x24x12' adj. rail slab, M.D.
SUNDSTRAND Model 3A Duplex 42" feed, Latest
SUNDSTRAND Model 3A Duplex 42" feed, Latest
TAYLOR & FENN M80 Duplex Spline, latest

MILLING MACHINES—Plain
BROWN & SHARPE #2, Light Type, Timken, Latest
BROWN & SHARPE #12, 24" feed, Latest Type
BROWN & SHARPE #12, 24" feed, Latest Type
BROWN & SHARPE #000, Timken, Latest Type
BROWN & SHARPE #2H, 3H, Timken, Latest Type
BROWN & SHARPE #2H, 3H, Timken, Latest Type
CINCINNATI 4-36 Hydromatic, Simplex, Latest Type
CINCINNATI #3, #4, #5 High Power, Latest Type
CINCINNATI 4-36 Hydromatic, Simplex, Latest Type
KEARNEY & TRECKER #2H, 3H, 4H, 5H, Latest
KEARNEY & TRECKER 1218, 1401, Simplex, Latest
KEMPSMITH #3G, #4 Timken, Latest Type
KEARNEY & TRECKER 4K, Timken Bearing, Late

MILLING MACHINES—Thread
LEES BRADNER Model LT, 6"x36" Centers, Latest
LEES BRADNER Model HT, 12"x54" Centers, Latest
LEES BRADNER Model HT, 12"x54" Centers, Latest
MOREY 12x30" 60°, 120°, 180° centers, Latest Type
PRATT & WHITNEY 4½"x12" Model C, Latest Type
PRATT & WHITNEY 6"x60" Model C, Latest Type

MILLING MACHINES—Universal
BROWN & SHARPE No. 2A, Timken Bearing, Latest
BROWN & SHARPE No. 3A, 4A, Motor Drive
BROWN & SHARPE No. 3A, 4A, Motor Drive
CINCINNATI #2MH, Timken, Latest Type
CINCINNATI #2MH, Timken, Latest Type
KEARNEY & TRECKER 2H, Timken, Latest Type
KEMPSMITH #4 Maxi-miller, Timken, latest type
KEMPSMITH #3 duplex, Motor Drive
VAN NORMAN #3 duplex, Motor Drive
VAN NORMAN #26, #28, Timken, Latest Type

MILLING MACHINES—Vertical
BROWN & SHARPE #2 Standard Timken, Latest
BROWN & SHARPE #2 Dial Type, High Speed, Latest
CINCINNATI #2, Dial Type, High Speed, Latest
CINCINNATI #6H, TIMKEN, Latest Type
CINCINNATI #6H, TIMKEN, Latest Type
GORTON 8D, 8½D Super Speed, Latest Type
KEARNEY & TRECKER 2H, 2K, 3H Timken, Latest
KEARNEY & TRECKER 2H, 2K, 3H Timken, Latest
MOREY 12M Single & Double Spindle Profiler, Latest
MOREY 12M Single & Double Spindle Profiler, Latest
REED PRENTICE 3VG, with or without hydraulic duplicator, Timken bearing, Latest Type

PLANERS
BETTS (CONSOLIDATED) 84"x32"x16' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
BETTS (CONSOLIDATED) 108"x8'x16' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
BETTS (CONSOLIDATED) 108"x8'x16' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
CINCINNATI 30"x30"x8', 4 heads, PRT, DC, M.D.
CINCINNATI 30"x30"x8', 4 heads, PRT, DC, M.D.
CINCINNATI 48"x48"x12' Openside, Motor Drive
CLEVELAND 48"x48"x16' 4 heads, Hydraulic,
DETRICK & HARVEY 48"x48"x16' 4 heads, Hydraulic, Motor Drive
DETRICK & HARVEY 48"x48"x16' 4 heads, Hydraulic, Motor Drive
Rapid Traverse, A.C., M.D.
NILES 108"x84"x16' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
NILES 42"x12"x14' "Time Saver" Box Table, 3 Heads, PRT, VARI-VOLTAGE Drive, Latest
NILES 96"x96"x24' 4 heads, Rapid Traverse, Box Table, D.C. reversing motor drive

PRESSES
BIRDSBORO 325 ton, vert, hyd., Latest Type
BLISS 75-25 Hydro-Dynamic, Double Action, Latest
BLISS 75-25 Quenching, Hyd., Motor Drive
GLEASON 15" Quenching, Hyd., Motor Drive
HENRY & WRIGHT 50 ton Dieing, Roll Feeds, M.D.
LAK 2 BRIS 500 ton Vert., Hyd., Latest Type
NILES 400 ton, Horiz. wheel, Motor Drive

SCREW MACHINES—Automatic
ACME GRIDLEY 2" Model RAS, 6 spindle, Latest
BROWN & SHARPE 2G, 1" capacity, M.D.
CLEVELAND 1¼" 6 spindle, High Speed, Latest
CONOMATIC 1¼", 8 spindle, High Speed, Latest Type
CONOMATIC 2¾"—6 spindle, high speed, Latest Type
GOSS & DeLEEUW 6"x6¼", 5 spindle Chucker, Tool rotating, Latest Type
GOSS & DeLEEUW 8" 5 spindle Chucker, Work Rotating, Latest Type

SHAPERS & SLOTTERS
AMERICAN 20" Heavy Duty, Motor Drive
DILL 20" 24" Vertical Motor Drive
GOULD & EBERHARDT 20", 32", High Duty, M.D.
PRATT & WHITNEY 6" Vertical, M.D.
ROCKFORD 36", Hydraulic Shaper-Planer, Latest

SHEARS—Power
WYSONG & MILES #372, 14 gauge x 9' Latest Type
QUICKWORK #7, ¾" Cap., Rotary Shear, M.D.
QUICKWORK #6, 1" Cap., Rotary Shear, M.D.

MISCELLANEOUS
AJAX 2", 3½" Forging and Upsetting, M.D.
BAKER #5 Keysester Motor Drive
BARNES #172, 306H, 307, 307H Vertical Hone, Hyd.,
Self Oiling, Latest Type
CAMPBELL #401 Abrasive Saw, Latest Type
DE LAVAL #194 Coolant Clarifier, Latest
FOSTER 4"x18", 12"x36" Superfinisher, Latest
HELLER Model SS-1 Cold Saw, 6" cap., M.D.
LANDIS 2" Single Spdle. Bolt Threader, M.D.
MANVILLE 2D 7/16" Cap. SSSD, Ball Header, M.D.
NAZEL #4B Pneumatic Hammer, M.D.
NORTON 2F 10U Vertical Lapper, Latest Type
PRATT & WHITNEY (KELLER) Type BL-2416 Type G, Copying 2 and 3 dimensional, Latest Type
ROWBOTTOM 12x6 Miller, Motor Drive
WATERBURY FARREL #29 Thread Roller, M.D.

WATCH THIS PAGE!

For MODERN high quality machine tools nearly all built new since 1941. These tools are priced well within your equipment budget. *Wire, write or phone for pictures, details and prices, today.*

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IMMEDIATE CLEARANCE — SURPLUS EQUIPMENT

ALL BUILT NEW — 1942 - 1947

AUTOMATIC SCREW & CHUCKING MACHINES
ACME GRIDLEY 2" RAS 6-spindle
CONOMATIC 1⅝" 8-spindle
CONOMATIC 2⅝" 6-spindle
GOSS & DeLEEUW 8" 5-spindle Chucking
GOSS & DeLEEUW 7½" 6-spindle Chucking

BORING MACHINES
HEALD No. 49 Double End Boromatic

DRILLING MACHINES
HAMMOND (FOOTE BURT) "G" Sensitive Radial
NATCO B225H Multiple spindle—Adj. spindles

CRUSHERS—STEEL TURNINGS
AMERICAN ring steel turnings crusher
GRUENDLER #3 x D steel turnings crusher

FURNACES
ECLIPSE, ELECTRIC FURNACE, LINDBERG, SALEM furnaces of various sizes and types

GLEASON EQUIPMENT
GLEASON #11 spiral bevel Rougher; Cyclex
GLEASON 15" Quenching Presses
GLEASON 25" Quenching Presses

GRINDERS—Centerless Internal
HEALD #81 Centerless Internal; Sizematic
HEALD #81 Centerless Internal; Gagematic

GRINDERS—RADIUS—Internal
VAN NORMAN #620 Auto. Oscillating

GRINDERS—Plain & Universal
BROWN & SHARPE No. 5 Plain; cap. 3x12"
BROWN & SHARPE No. 2 Universal

GRINDERS—SURFACE
HEALD No. 22-12" rotary
TAFT PIERCE 6" Precision Rotary

GRINDERS—MISC.
BROWN & SHARPE #13 Univ. & Tool
BROWN & SHARPE No. 10 Cutter & Tool
HANCHETT-BADGER #214 double spindle, 16" steel disc plate
PORTER CABLE AG8, G-8, BG-8 Abrasive Belt Sander

JIG BORING MACHINE
MOORE #1 Precision type

MISCELLANEOUS
SCHAUER IDEAL bench type Speed Lathes
OLIVER #94D "Strait" Cut-off Saw
RANSOHOFF Model #20 Conveyor Type Washing Machine
PHYSICIST ANDEROMETER for measuring assembled anti-friction bearings
LAWTON 75-ton Double Ram Opposed Hydr. Presses; vert.
ACME Automatic 12-coil winding machine
CRESCENT 3000# LDLF Platform elev. Electric Trucks
CLARK FORK TRUCK—6000#; 6 ft. Lift
HILLCO Oil Reclaimer type 50 CM-1—(NEW)
STEPHENS ADAMSON Floor Mounted Weight Lorry

and many other miscellaneous items
ASK FOR COMPLETE LIST

ALL EXCELLENT CONDITION — PRICED FOR QUICK SALE — ACT NOW

CONTACT MR. J. SALOWAY c/o

JACK & HEINTZ PRECISION INDUSTRIES, Inc.

17600 BROADWAY **Telephone: BROADWAY 1000** **CLEVELAND 1, OHIO**

PRODUCTION MILLS

4-48 CINCINNATI Hydromatics, Tracer Controls (6)
4-60 CINCINNATI Duplex, Tracer Controls
2-24 CINCINNATI Hydromatic

Send Us Your Inquiries

INTERNATIONAL MACHINERY CO.

3131 E. JEFFERSON AVE. **DETROIT 7, MICH.**

NEW — SURPLUS

METAL CUTTING BAND SAW BLADES—100' ROLLS

Size	No. of Teeth	Price Per Roll
⅛"	14	$6.00
3/16"	10, 14, 18	6.50
¼"	10, 14, 18, 24	7.82
⅜"	10, 14, 18, 24	8.30
½"	6, 10, 14, 24	8.60

VICTOR MACHINERY EXCHANGE, INC.

251 CENTRE ST. **NEW YORK 13, N. Y.** **CANAL 6-5575**

HYDROTEL—Cinc. Vert. Miller, 28"x60" 4 Spindles, 360° Auto. Tracer (1942)

MILLER—K. & T. #4K, Plain Horiz. (late)
MILLER—Vertical #3 Shields with all-angle head (1942).
PLANER—N.B.P. 48"x48"x26', 4 Heads
TURRET LATHE—#3L Gisholt (1942)
BORING MILL—D. & H. 3½" Floor (Bargain)
SLOTTER—Newton 24"x42" Table
THREAD MILL—Morey 4"x10' Centers (1942)
ROLLS—BENDING—H. & J. 30'x¾" Pyr. Southwark 15'x3" Pyr. Vertical
BERTSCH ANGLE ROLLS—3"x3"x⅜"
PLATE EDGE PLANER—32'x2"
PRESSES—Z & H #7, 50 Ton, Percussion
Bliss #6, 125 Ton (Late)
Clearing, 200 Ton (Late)
Bliss #310, 450 Ton
Bethlehem, 1000 Ton, Hydraulic, Bed 72"x 144"

KINGS COUNTY MACHINERY EXCHANGE

408 Atlantic Ave., Brooklyn 17, N. Y.
Dept. "A" **Phone TRiangle 5-5237**

BL-2420 KELLER (P&W)
3 Spind., 3 Dimen. (New 1942)
3 Tracer Spindles, Gener. Set
Large Assortment of Tools

ROSENKRANZ, WEISBECKER COMPANY
149 Broadway • New York 6, N. Y.

FOR SALE
MODEL #48-A HEALD SINGLE END PRECISION BOREMATIC
Double Spindle Machine with Two Heald Redheads. Complete, Ser. #14613.
PRICE $1150.00
PRACTICALLY NEW

WINSTON MACHINERY CO., INC.
517 SO. Delaware St., Indianapolis 4, Ind.

PLATE STRAIGHTENING ROLL
#12 BERTSCH SEVEN ROLL. New 1942. AC motor drive. Capacity ⅝" in mild steel. Dia. and length of rolls 11½" x 72".

J. L. LUCAS & SON, INC.
P. O. Box 3006A Bridgeport 5, Conn.

AARON FOR ONE OF THE LARGEST STOCKS OF MODERN MACHINERY AT LOWEST PRICES—MONEY BACK GUARANTEES

AUTOMATICS
Brown & Sharpe #2G 1¼" cap. (2)
Brown & Sharpe, Nos. 00G, 4 and 6.
Conomatic 8 sp. 1¾" cap.
CECO ⅝", Swiss Type
Fay Automatic, 12"x81".
New Britain No. 61—2¼" 6 spd.

BORING MILLS
Giddings & Lewis No. 0, No. 25T.
Lucas No. 31, horiz., Head single & dble. spd.
Universal 3" horiz. equipped.

DRILLS AND RADIALS
Allen, 6 spindle, 7" overhang.
Cinci-Bickford Sup. Ser. 21".
Carlton 8' 19" col., Canedy-Otto 3' 9" col.
Sibley 24"-28", Power Feeds
Hamilton, Langelier, Hi-Speed.

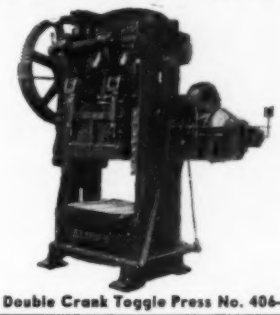
ENGRAVERS
Gorton No. 3U, 2 dimen.
Deckel GK1, 3 dimen.
Gorton Cutter Grinders 875-2, 265-E.

GEAR EQUIPMENT
Barber Colman No. 3 Precision & Plain
Fellows 72, 725, 645Y, High Speed.
Gleason #2 Surface Hardener.
Gleason #5 Generator
Gleason 3" Spur Bevel Generator
Hamilton Hobber
Michigan, Gleason, Fellows Checkers.
Mikron Gear Hobber.

GRINDERS, MISCELLANEOUS
Brown & Sharpe No. 5 cyl. 3" x 18".
B. & S. Nos. 1, 2, 3 Univ.
B. & S. No. 13 Univ. & Tool.
Cinc. No. 2 Centerless Filmatic.
Cinn. 12 x 30", 12 x 48" Filmatic Univ.
Covel No. 91A Univ. Tool & Cutter.
Dalzen Thread, latest
Gardner #226, 20" Disc.
Hanchett #228 Disc. Dbl. opposed.
Heald 72A3 Sizematic Int. Centerless.
Jones & Lamson Thread, Univ. TG36
K.O. Lee Tool & Cutter.
Landis Centerless.
Landis No. 4H Cyl. 4x 12", No. 6 Thread.
Norton No. 2 Tool & Cutter, Hyd.
Oliver 610 Drill Grinder, Sellers 4G Drill Grinder

GRINDERS, SURFACE
Abrasive #2B, 8"x24" cap.
Abrasive No. 88, 84 Vert., 8 x 24
Blanchard No. 11, 16" Mag. Chuck.
Brown & Sharpe No. 5, 8x24" Hydr.
G. & L. No. 25, 35 Hyd., 6 x 18", 8 x 24".
Hanchett Model 800, 13 x 48".
Norton 6x18", and 10x36" Hyd.
Reid No. 2A P.F. MIB.
Reid No. 2C Pope Spdl. Hand Feed.
Thompson Hyd. 6 x 10 x 18", 6 x 12 x 18".

LATHES
Bradford 14"x6', G.H. Latest Sebastion 12"x4'
Hardinge Precision, 1" Collet Cap., Rivett. Precision.
Hendey G.H. 16x30", Rel. Att.



Bliss Double Crank Toggle Press No. 406— 48"

Bliss #1½B Toggle Press Geared, 1945.
Bliss No. 304A, 305A, 306 Straight Side Presses.
Bliss #9—Bed 42x96"—250 Ton.
Bliss 645B, 650, 675 High Production Presses
Henry & Wright 75, 25 Ton Dieing Presses

HYDRAULIC PRESSES
DOWN MOVING RAM, SELF CONTAINED

MANUFACTURER	TON CAP.	STR.	OPENING	PLATEN
Lake Erie	500	36"	68½	35 x 36
Baldwin Southwark	400	32"	36"	76 x 59
H.P.M. Double Action	500	24"	30"	36 x 36
Watson Stillman Shaft Straightener	500	24"	57"	24" bed.
Denison	25/50	18"	23"	22 x 20
Hamilton	50	20"	30"	22 x 30
Southwark, D. A. Clamping Plate	150	30"	2' to 4'	84 x 30
Oilgear Shaft Straightener	35	8"	12"	84 x 11

DOWN MOVING RAM, WITHOUT POWER UNIT

Mesta	750	42"	80"	44 x 44
Chambersburg	300	10"	27"	22 x 36
Southwark	350	42"	78"	28 x 48
Southwark	550	23"	68½	42 x 32

UP MOVING RAM PRESSES

Waterbury Farrel	1000	7"	55½"	30 x 28
Waterbury Farrel	800	6½	28"	22 x 24
Waterbury Farrel (3 Rod)	500	4"	28¾"	28" Bet. Rods
Watson Stillman	300	12"	21"	24 x 20
Watson Stillman	300	12"	19"	20 x 20
Watson Stillman (Hob) New and Used	300	6"	22"	16 x 16
HPM	180	15"	14½	30 x 30
Dunning & Boschert Molding Press	300	12"	38"	24 x 32 Mold
Stokes Molding Press and Pump	150	7"	24"	22 x 15
Stokes Molding Press and Pump	150	8"	31"	24 x 23
Elmes—With Elec. Plates	50	6"	12"	18 x 18
Stewart Boling	85	10"	19"	20 x 20

WHEEL PRESSES
NILES—400 ton 96"; 500 ton—48"; 300 ton—48".

INJECTION MOLDERS

ACCUMULATORS

Mfr.	Size	Pounds
HPM	6" x 9'	2800
General Electric	15" x 11'	400
Watson Stillman (13 gal) Hydr. Pass.	42 x 9 x 48"	3000

LeBlond Regal 10"x3½', 15"x30", 16"x40" TA, 19"x48" TA, 21"x 60"
LeBlond Heavy duty 16"x30".
Lodge & Shipley 16 x 78" T.A., Collets, etc., and 20" x 54" equipped.

Monarch 10"x 20" EE, 16 x 78 G.H. 12x30", 18"x30", dble. compound
South Bend Q.C.G., 13"x6', 10"x4', 14½"x6'

MILLS, PRODUCTION
Brown & Sharpe, No. 000, 12, 21.
Cincinnati No. 1-12, 1-18, 2-18 Mfg.
U. S. Multimiller, 1 and 2 Spindles.
Sundstrand 00 Rigidmills, Kent Owens IV.

MILLS, PLAIN AND UNIVERSAL
B. & S. No. 2B Plain
B. & S. No. 2A Univ.
Cincinnati No. 3 Plain
Cincinnati No. 2MH Univ., H.S.
Milwaukee 2HL, 2H Univ., H.S.
Milwaukee No. 2H Plain.
Van Norman Duplex, 12, 20, 22L, 36.

MILLS, VERTICAL
Bridgeport, Index, Jackson
Brown & Sharpe No. 2 Standard.
Cincinnati No. 4, Hi-Power.
Gorton No. 8D, 9J Plain, 8½D Duplicator.
Morey No. 12M Profiler 2 sp.
Sipp MP5 Jig Borer.

PRESSES
Bliss No. 304A, 4" Str. 23"x24"
Bliss No. 305A, 4" Str. 30" x 30"
Bliss No. 645B, 650, 675 Hi-Production, 58, 62, 62A, 162.
Bliss No. 9 42"x96", 250 Ton
Bliss No. 4½ Double Action Cam
Henry & Wright Dieing, 25 Ton, 75 Ton.
L. & J #22, 3, 4, O.B.I.
Reliance 45 Ton, O.B.I.
Gen. Sew Press.
Z. & H. 30 Ton, O.B.I.
Stokes Tablet Presses, Model R & T.

TURRET LATHES
Acme No. 4W, 6W Bar and Chuck, Acme Fox.
Bardons & Oliver No. 3, 1½" cap., No. 5, Chuck.
Brown & Sharpe No. 1, 2F, Foster No. 3B.
Gisholt No. 4, 5 Bar and Chuck, 1L.
J. & L. No. 8A, Well Tooled, Excellent, Saddle type.
Warner & Swasey No. 3, 4, 5, Preselector, No. 4A 8" Cap.

MISCELLANEOUS
Band Saw: Doall V16 Contour, ML., Tannewitz No. 36M.
Bending Roll: Buffalo No. 0, Excelsior 14, Buffalo Wrapping Roll No. ½.
Broach: American Horiz. Hyd. B-15-60.
Broach: Colonial 6 Ton Vert. #VMS 636.
Hacksaw: Marvel Nos. 6 and 6A Automatic Feed.
Notching Press: Ferracute C82.
Pin Machine: Nilson.
Shaper: Sheldon 12" Brand New 24" Rockford Hyd. Heavy Duty.
Shaper: P&W 6" Vertical.
Honer: Micromatic Hydrohoner, Sunnen.
Keyseaters: Mitts & Merrill, Baker, Burr, Davis
Rivet Hammers: Hi Speed, Chic. Pneumatic.
Toolmakers Microscope: Gaertner, Bausch & Lomb, Leitz
Router: Onsrud W240, #55 Oliver.
Tapper: Bakewell #1, Haskins 3C.
Welders: Spot & Seam: Thompson, Taylor, Winfield.

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AARON MACHINERY CO., Inc.

45 Crosby Street — **New York 12, N. Y.**
WOrth 4-8233 — **Cable: AARMACH, N. Y.**

MONA MEMBER

LATE TYPE MACHINE TOOLS

AUTOMATICS
6" RAP-8 Acme-Gridley Chucker. 1941.
16" Bullard Mult-Au-Matic, 6 spdl. 1941.
3½" Cleveland Model A. 1943.
2½" Cleveland Model A. 1943.
2⅝" RA-8 Acme-Gridley. 1943.
1⅝" Greenlee, 6 spindle. 1942.
9/16" RA-6 Acme-Gridley. 1942.

BORING MACHINES
No. 42 Lucas Horizontal. 1940.
No. 54 Excello Double End. 1940.
No. 46B Heald Single End. 1940.

DRILLS
3' 9" Morris "Mor-Speed". Latest.
No. 415 Defiance, box column. 1944.
No. 217 Baker, box column. 1942.
No. 5 BM Fosdick, box column. 1942.

GEAR EQUIPMENT
3" Gleason Generator. 1941.
No. 6 & 17 Gleason Testers. 1943.
12" Red Ring Internal Shaver. Late.
No. GCL Red Ring Shaver. 1942.
No. 624A3 Fellows Side Trimmer. New.
No. 645A3, 615A & 61A Fellows. 1944.
No. 712SA & 712 Fellows Shaper. 1943.
Vinco Spline & Gear Grinder. 1942.

GRINDERS, CYLINDRICAL
25"x48" Landis, Crankshaft. Like New.
16"x36" Cincinnati Plain. 1942.
12"x48" Cincinnati Univ. 1943.
10"x72" Landis Plain. 1942.
10"x18" Norton Plain. 1942.

GRINDERS, INTERNAL
No. 74 Heald Ext. Bridge. 1941.
No. 72A3 & A5 Heald Plain. 1944.
No. 5 & 16A22 Bryant. Latest.

GRINDERS, SURFACE
12"x16"x60" Thompson Hyd. Latest.
No. 22 & 25A Heald Rotary. 1943.

LATHES, ENGINE
45"x192" Axelson. 1942.
24"x168" Sidney. 1942.
18"x54" Lodge & Shipley. 1943.
16"x48" Bradford. 1942.

LATHES, PRODUCTION
Gisholt "Simplimatic". 1940.
No. 3A L6S "Duomatic". 1943.
No. 2FU Foster "Fastermatic". 1943.
9"x108" Lo-Swing Semi. Auto. 1942.
Model 9, 10 & 12 Sundstrand. 1942.
14"x42" Monarch "Magna-Matic". 1941.

LATHES, TURRET
42"x36" Bullard Vertical. 1943.
No. 1A, 2A & 3A Warner & Swasey. 1943.
No. 1 & 6½"x24" Acme Univ. 1943.
No. 2, 3 & 4 Warner & Swasey. 1943.
No. 3, 5 & 7 Bardons & Oliver. 1942.

MILLS, PLAIN
No. 5 Cincinnati. 1943.
No. 4H & 4K Milwaukee. 1943.
No. 3 Van Norman. 1942.
No. 2HL Milwaukee. 1942.

MILLS, PRODUCTION
No. 1-14 & 2-20 Kent Owens. 1942.
M-18 Kearney & Trecker. 1943.
No. 1224 Kearney & Trecker. 1942.
No. 3-36 Cincinnati Duplex, R & F. 1942.
No. 1-18, 2-18 & 2-24 Cincinnati. 1942.

MILLS, THREAD
6"x60" Pratt & Whitney. Latest.
12"x54" Lees Bradner. 1943.
6"x36" Lees Bradner. 1942.

MILLS, UNIVERSAL
No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.
No. 26U & 26SU Van Norman. 1942.

MILLS, VERTICAL
No. 3B P&W Univ. Die Sinker. 1943.
No. 2K & 3H Milwaukee. 1942.
No. 2 & 3 Cincinnati. 1942.
No. 1 Cleveland. 1942.

PRESSES
No. 40—51½ Minster. 1942.
100 Ton Hannifin, Hyd. Str. 1942.
50 Ton Denison, Hyd. Str. 1942.

INDIANAPOLIS MACHINERY & SUPPLY CO.
1961 S. Meridian St.
INDIANAPOLIS 6, IND.

PERFORMANCE TESTED *Machine Tools*

LATHES

Lodge & Shipley 14"x6" and 8', 12 spd. sel. gr. hd. 33½" and 58" C.D. Attachments. Motor in base.

Monarch 20"x72" centers model "M", 16 spd. gr. hd. 22½" swing, Monarch automatic sizing control (late).

Lodge & Shipley 24"x12', 12 spd. sel. gr. hd. 27½" swing, 76" C.D.

Lebland 33"—60" Sliding Gap lathe, 9'2" C.D. Gap closed, 14'2" C.D. gap extended.

RADIAL DRILLS

American 4'12" triple purpose M.D. #4 taper and 4'11" American 24 speed 7½ HP motor-on-arm, triple purpose.

Fosdick 5'17" and 5'15" motor on arm "Economax" Hydr. #6 taper (very late).

BORING MILLS

Universal 4" bar "Tri-way", face plate to outer support 72", #6 taper, added vertical range (late).

Defiance 25A, 3¾" bar, face plate to outer support 72", #6 taper, added vertical and cross range (late).

Yoder #3A, 3" bar, face plate to outer support, #5 taper (late).

Lucas #33, 4½" bar, face plate to outer support 84", #6 Morse taper, A.C. motor drive.

Fisher 5" floor type, vert. travel hd. 60", hor. travel col. 110", platen (very late).

TURRET LATHES

Warner & Swasey #3, 1¼" cap., #4 2" cap. ram type Universal bar and chucking, tooling.

Jones & Lamson #5, 2½" cap. ram type Universal, bar and chucking.

Warner & Swasey #2A, 2½" cap., #3A, 4½" cap., saddle type, Universal rpd. trav. full length lead screw, bar and chucking.

Jones & Lamson #7A, 2½", #8A, 3", #7D, 2½", saddle type Universal, rpd. Trav., bar and chucking, tooling.

GRINDERS

Brown & Sharpe #2, 14"x30", #4, 14"x60", Universal tooling & attchmts. (very late).

Farrel 30"x182" M.D. roll grinder, max. face ground 182", min. dia. ground 9".

MISCELLANEOUS

(New) Rafter All Steel Power Squaring Shears, available in two sizes: ¼"x10' mild steel, ⅛"x10' stainless steel;
3/16"x12' mild steel, 3/32"x12' stainless steel, stock delivery.

This Is Only a Partial Listing. Send for Our Catalog.

Botwinik Brothers of Mass. Inc.
3 SHERMAN ST. WORCESTER 1, MASS.

No. 2 Jackson Vertical Mill.
H.P.M. 100-ton Hydraulic Press.
National Acme No. 1T Thread Roller.
No. 2 Norton Tool & Cutter Grinder.

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

Bor. Mill, Hor. 4½" Bar N-B P.
Bor. Mills, Vert. 24"-36"-42"-60"-72".
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
Grinder Surface, #2 Diamond, Mag. chuck.
Lathes, Turret, 3A W. & S., and 24" Gisholt.
Millers, Plain, No. 3, 4, & 5-B Cincinnati.
Millers, Vert. No. 3 & 4 Cincinnati.
Shaper, Draw Cut, 36" Morton.
Swager, 53 Etna, 1" tubing.

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

McDONALD USED MACHINERY

Colburn 62" Hvy. Duty Vertical Boring Mill
G & L and Universal 3" Bar Horiz. Boring Mills
Campbell 9" Cap. M.D. Abrasive Cut-Off Mach.
Meline 6-Sp. Hole Hog Drill, Barnes 4-Sp.
28" All Grd. Camel Back Drill
Cin-Bick 3' & Morris 3½" Arm Radial Drills
Do-All 8 x 24" Horiz. Sp. Hyd. Surface Grinder
Blanchard M.D. Vert. Sp. Surface Grinder 20" chuck
L. & S. 20" x 8', 18" x 12', 28" x 10', 25" x 12'
Monarch 20" x 8', Amer. 20" x 12' grd. bd. q.c.g. m.d. Engine Lathes
B. & S. Nos. 2-B & 3-B, Cin. No. 3 Mil, No. 2-B & 3-B, Cin. No. 5, LeBlond No. 4, Grd. Hd. Plain Millers
B. & S. No. 2-A & 3-A, Mil. No. 2-B, Cin. No. 1-M, Cin. No. 2, Grd. Hd. Univ. Millers
Avey 2-Spindle MAG Drill Press late.
Niagara 12' Power Square Shear, 10-Ga. 18" gap late
Cin. #3 Vert. Miller Late
Cin. 24" M.D. Univ. Shaper.
Cleveland 48" x 12" Table Open-side Planer, 3 Hds.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

IN STOCK

Potter & Johnston #4D Timken Head, A.C. M.D. Chucker
Heald No. 49 Borematic, 2 Spindle Hydraulic Cross Table
Fisher, 5" Bar Floor Type Horizontal Boring Mill, AC-DC Drive
Gorton 3L—Three Dimensional Pantograph with Cutter Grinder
Bliss O.B.I. & Double Crank Presses
U. S. Tool Nos. 22, 25, 33 Multi-Slides
NILSON & BAIRD FOURSLIDES

National Machinery Exchange
128-138 Mott St., New York 13, N. Y.

FOR SALE

Murchey No. 32 Thread Miller, Serial U-2789, Single Spindle—8" spindle to table, Capacity—Internal or external 1" to 4" dia. New in 1944—in storage 1945 to 1949. Connected and can be demonstrated.

ITHACA GUN COMPANY, INC.
ITHACA, NEW YORK

For Sale
DIEING PRESSES
2—25 TON HENRY & WRIGHT Double Roll Feed, Scrap Cutter, M.D.—A-1 Cond.
SEABOARD STEEL CO., INC.
New Haven, Conn. 8-0929

CYLINDRICAL GRINDER
14" x 48" CINCINNATI Plain. New 1942.
Five AC motor drive.

J. L. LUCAS & SON, INC.
P. O. Box 3006A Bridgeport 5, Conn.

PRACTICALLY NEW
PEERLESS HYDRA-CUT SAW. Size 7"x7", with 20 Ft. Automatic Table, and Multiple Bar Clamping. Serial No. AX7-167. LATEST TYPE.
PRICE $1350.00

WINSTON MACHINERY CO., INC.
517 So. Delaware St., Indianapolis 4, Ind.

EASTERN OFFERS FROM STOCK

BROACHING MACHINES

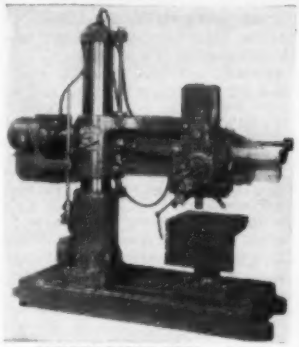
No. 4 Oil Gear Hydraulic, m.d., 64" stroke
75 H.P. LaPointe Horiz., 156" stroke, 32½ tons cap.
Cincinnati Mill Broach, m.d., 10" spindles, new

BALL BEARING DRILLS

Model D 1100 B Walker-Turner Bench Type, 20" size, brand new
No. ½ 1, 2 Avey, bolted m.d.
No. 1B Edlund, m.d., new
No. 3—12" Foote-Burt Single Spindle, m.d.
No. 2LMB Leland-Gifford, m.d. Deep Hole, latest
No. 3 Allen, bolted m.d., 12" overhang, No. 3 Taper
No. 4 Foodick, 8" overhang, bolted m.d., No. 2 Taper
No. 48M—24" Foodick, m.d., latest
No. 9M—16" Foodick, m.d.
1 spindle No. 3 Avey Type B, style MAS, m.d., No. 3 Taper, latest
2 spindle 20" Casady-Otto, m.d., No. 4 Taper
2 spindle No. 3 Avey, bolted m.d., p.f.
5 spindle No. ½ Avey Heavy, direct m.d., latest
3 spindle Leland & Gifford, m.d. on each, No. 3 Taper
4 spindle No. 2 Avey, bolted m.d.
4 spindle No. 2LMB Leland-Gifford, 28" swing, m.d. on each spindle
4 spindle No. 2 MAS Avey High Speed, m.d. on each spindle, No. 2 Taper
6 spindle No. ½ Avey, Model MAS, m.d., latest
6 spindle Leland & Gifford, No. 2 Taper, m.d. on each
6 spindle 2B Edlund, m.d., No. 2 Taper
5 spindle No. 3 Avey, bolted m.d.
6 spindle Henry & Wright, m.d., 15" overhang, No. 2 Taper

HORIZONTAL DRILLS

Morris Horizontal Mer-Speed, m.d.
No. ½Bx30" P.&W. 2 spdle. Deep Hole Reaming Machine, m.d.
No. ½Bx50" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. ½Bx50" P.&W. Chambering Machine, m.d., latest
No. 1Bx74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. 1½x105" P.&W. 2 spindle Deep Hole Drill, m.d., latest
No. 1½x105" P.&W. 2 spdle. Gun Barrel Rifling Machine, m.d.



CARLTON RADIAL DRILL — latest

No. 1 P.&W. 2 spindle Deep Hole Drill, bolted m.d.
No. 1½ Pratt & Whitney 2 spindle, m.d., older type
Pratt & Whitney Rifling Machine, belt
5 spindle Detroit Semi-Automatic Drill, belt
2 spindle No. 410 W.F. & John Barnes Deep Hole, m.d.

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head, 15 spindles
No. 3 Baush, m.d., 20x40" head, 15 spindles
P7 Baush Hyd., m.d., 20x30" head, 12 spdles., latest
D13H Natco Hydraulic, m.d., 18x12" head, 10 spdles.
No. 16 Foote-Burt Fixed Center, m.d.
2 spindle 21" Cincinnati-Bickford Upright, m.d.
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 12" Rockford Gang, m.d.
4 spindle Foote-Burt Rail, No. 4 Taper, m.d.
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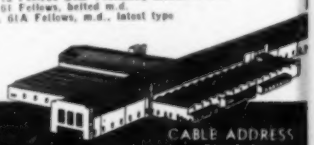

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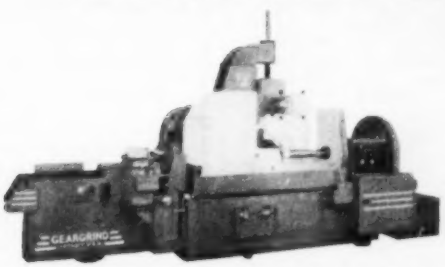

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Nos. 3E & 3H E. & T. Pl. Dial Millers, late
No. 36 Van Norman Pl. Miller, ram, '43
No. 2G Kempsmith Univ. Miller, 1943 (3)
No. 2416 Keller Duplicators, late
No. 9J Gorton Duplicator & Vert. Miller (2)
12"x24" G. & L. No. 45 Surface Grinder, '42
No. 70A Heald Internal Grinder, 1942
Gear Cutter, No. 13 B. & S., spur & bevel
30"x20' cen. Axelson Lathe, T.A.
30"x120" Hanchett Plano Surface Grinder
3" Univ. Table Mill, 40" vert., 72" hor., '43
36" Bullard Spiral, 3 motor Hi-speed
No. 2 Stand. K. & T. Univ. Miller, Timken
Gear Gen., No. 61A Fellows, 1943
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LEES-BRADNER—#40A Thread Miller
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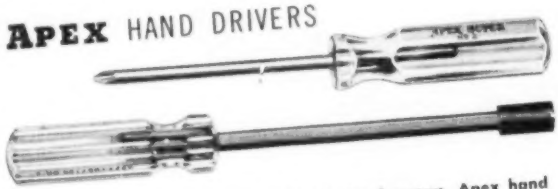

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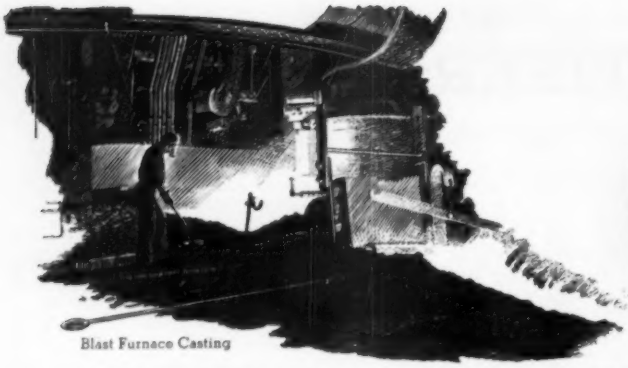

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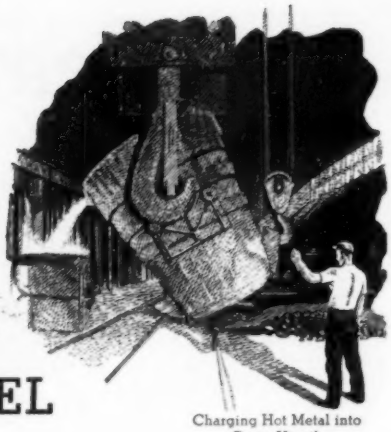

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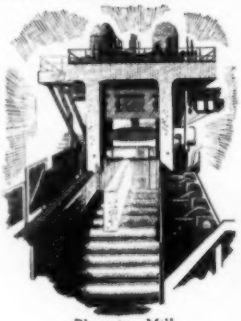

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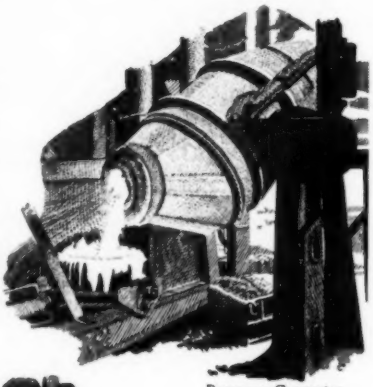

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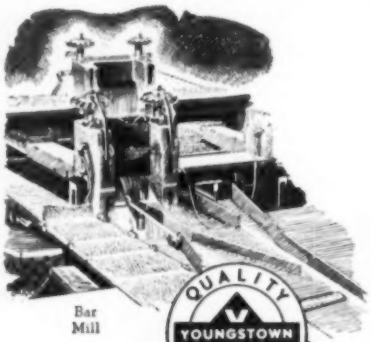
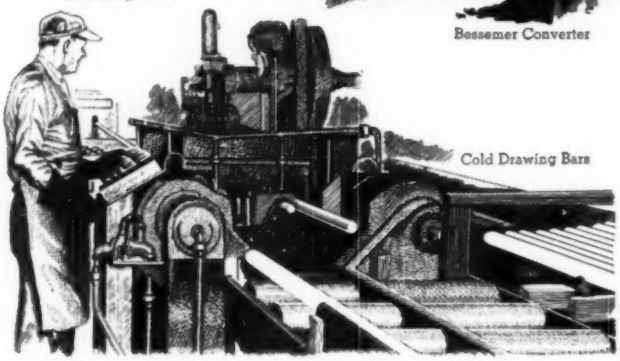


Bar Mill



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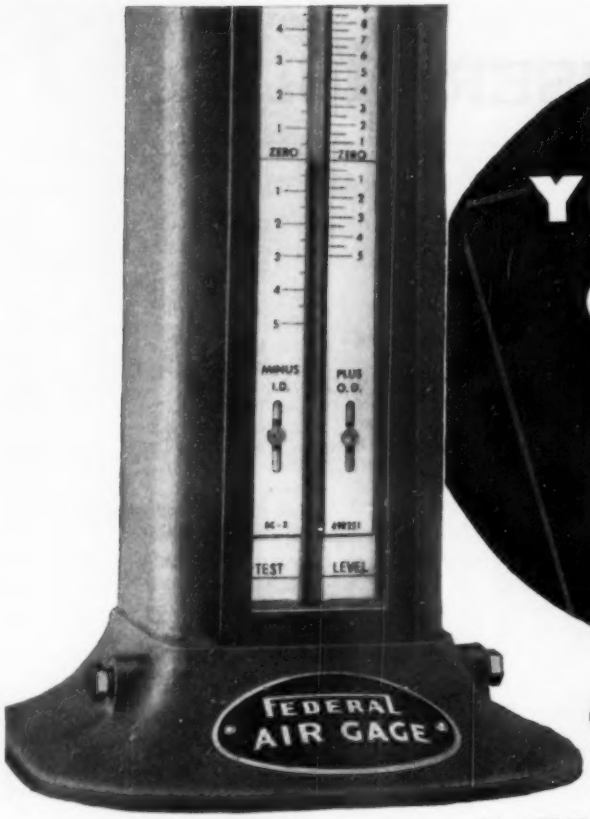

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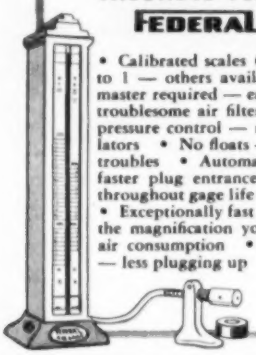

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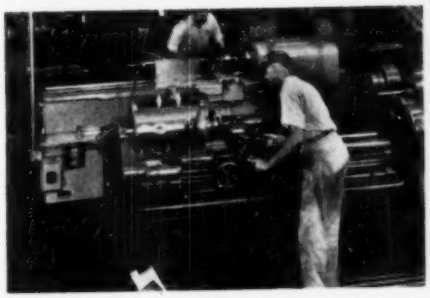
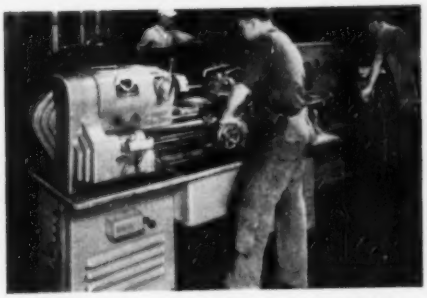
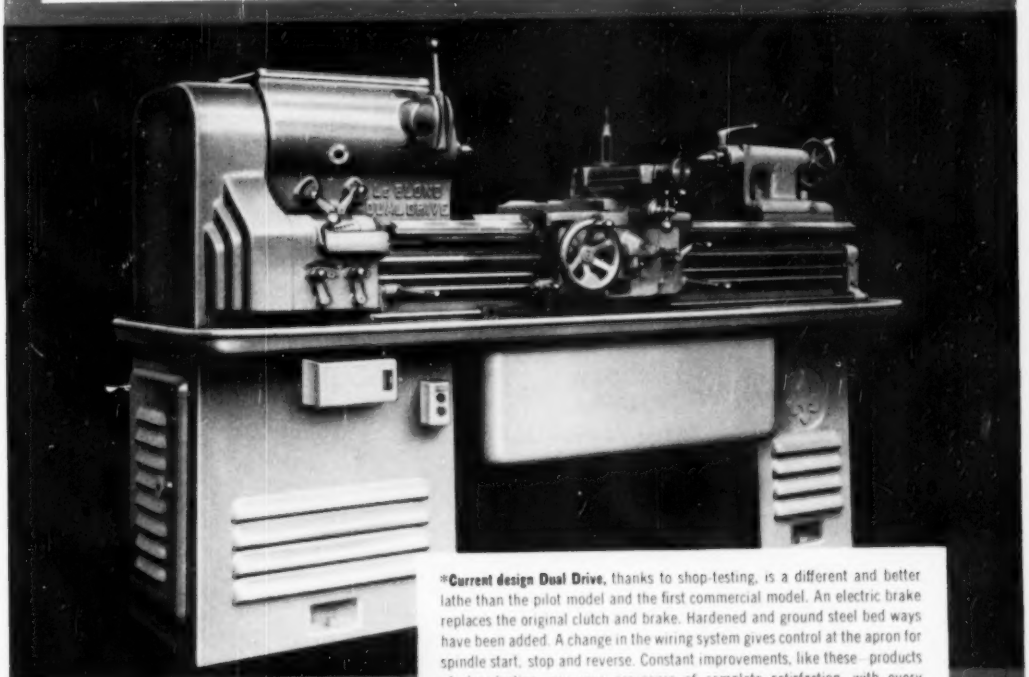


Pilot model Dual Drive, first of a new line, goes on the job in LeBlond's lathe department 2, for daily 2-shift testing and observation.



18 months later first commercial model is shipped to Black Bros., Mendota, Ill. Because of shop-testing, Black Bros. knew the Dual Drive was ready for their exacting requirements.



***Current design Dual Drive,** thanks to shop-testing, is a different and better lathe than the pilot model and the first commercial model. An electric brake replaces the original clutch and brake. Hardened and ground steel bed ways have been added. A change in the wiring system gives control at the apron for spindle start, stop and reverse. Constant improvements, like these—products of shop-testing—are your assurance of complete satisfaction—with every LeBlond machine tool.

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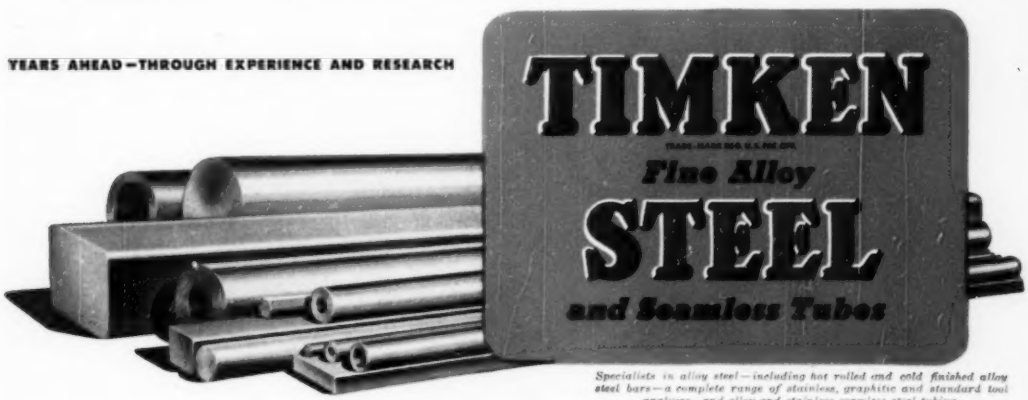

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